EKOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ekologija
Course title:	Ecology
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037273
Koda učne enote na članici/UL Member course code:	3775

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	40	170	10

Nosilec predmeta/Lecturer:	Mateja Germ
Izvajalci predavanj:	Andraž Čarni, Marko Debeljak, Alenka Gaberščik, Mateja Germ, Ivan Kos, Matevž Likar, Tomaž Skrbinšek, Gorazd Urbanič, Al Vrezec
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični/theoretical
Jeziki/Languages:	Predavanja/Lectures: Angleščina, Slovenščina
	Vaje/Tutorial: Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrollment in doctoral study

Vsebina:	Content (Syllabus outline):
Sklop 1: Funkcionalna ekologija rastlin Sklop vključuje različne vidike interakcij rastlin z okoljem, vlogo rastlin pri oblikovanju okolja ter njihove prilagoditve na razmere v okolju. Posebej bo izpostavljen pomen rastlin za uravnavanje okoljskih razmer in za ekosistemske storitve. **Sklop 2: Ekologija vodnih rastlin**	**Set 1: Functional plant ecology** The set includes various aspects of the interactions between plants and the environment, their role in creating environment as well as their adaptations to the environmental conditions. In particular, the importance of plants for the regulation of environmental conditions and ecosystem services will be highlighted.

Sklop bo zajemal najnovejše izsledke o vlogi vodnih rastlin v ekosistemu, o pojavu invazivnih tujerodnih vodnih rastlin, uporabnosti vodnih rastlin kot bioindikatorjev, odzivu rastlin na strese iz okolja. Zajemal vsebine o vsebnosti selena v izbranih slovenskih vodotokih, vplivu Se na vodne rastline ter vlogo silicija v vodnih rastlinah. Sklop bo zajemal tudi vpliv globalnih sprememb na vodne ekosisteme s poudarkom na vodnih rastlinah.

Sklop 3: Vegetacija

Sklop povzema preučevanje vegetacije in obsega obdelavo najnovejših domačih dosežkov in pregled metodološkega razvoja vede v preteklem obdobju. Poseben poudarek bo na obdelavi velikih podatkovnih baz in uporabi numeričnih metod pri iskanju odgovorov na različna raziskovalna vprašanja (fitogeografska, ekološka, iskanje razlogov za spremembe v okolju itd.). Poleg tega pa se bomo tudi seznanili s uporabno vrednostjo rastlinskih združb pri opredelitvi habitatnih tipov in vrednotenju sprememb v okolju.

Sklop 4: Medvrstni odnosi

Sklop vključuje: (1) uvod v ekologijo medvrstnih odnosov in funkcionalne povezave vrst v združbah, (2) tipe in značilnosti neposrednih odnosov, (3) večvrstne interakcijske komplekse (posredne odnose), (4) vpliv sprememb medvrstnih odnosov na delovanje ekosistemov, (5) problematiko vnašanja tujerodnih vrst v naravne ekosisteme ter invazijski proces naturalizacije tujerodnih vrst v naravnih ekosistemihin ekologijo invazijskih stopenj in (6) koevolucijo sobivajočih vrst (pravilo Rdeče kraljice), vključujoč koevolucijo patogenov in gostiteljev.

Sklop 5: Ekologija mikorize

Študentu bodo predstavljeni ekološki aspekti interakcij mikorize, ki obsegajo: 1) pojavljanje in značilnosti mikoriznih povezav glede na klimatski pas in ekosistem; 2) pomen mikoriznih interakcij na nivoju rastlinske in glivne združbe in 3) potencialni vplivi klimatskih sprememb na oblikovanje in funkcioniranje mikoriznih povezav. Študenti bodo tudi spoznali sodobne pristope preučevanja mikoriznih interakcij (metagenomi, umetna inteligenca).

Sklop 6: Funkcionalna biodiverziteta

Obravnava funkcionalne biodiverzitete v kopenskih ekosistemih s poudarkom na evolucijsko pogojeni vlogi živalskih populacij. Na primeru referenčnih živalskih skupin (Lumbricidae, Chilopoda; Mammalia) predstavitev vloge pri ključnih ekosistemskih procesih. Vključevanje omenjenih skupin v upravljanje s kopenskimi ekosistemi. Njihova ogroženost in varstvo v kulturni krajini.

Sklop 7: Ekologija celinskih voda

Sklop vključuje naslednja področja: (1) Naravne in antropogene spremembe v vodnih ekosistemih in njihovih prispevnih območjih: sprememba habitata, onesnaževanje, raba zemljišč, čezmerna izraba

Set 2: Ecology of aquatic plants

This set will cover the latest findings on the role of aquatic plants in ecosystem, occurence of invasive alien species and usefulness of aquatic plants as bioindicators as well as the response of plants to environmental stresses. It will address the content of selenium concentration in selected Slovenian rivers, the effects of selenium on aquatic plants, the ability of plants to uptake of selenium and the role of silicon in aquatic plants. The set will also cover the impact of global changes on aquatic ecosystems with an emphasis on aquatic plants.

Set 3: Vegetation

The set deals with the study of vegetation and elaborates the latest achievements and overview of the methodological development of science in the recent period. Special emphasis will be on the processing of large databases and application of numerical methods to address different research questions (phytogeographical, ecological, reasons for changes in the environment, etc.). In addition, we also noted the practical value of plant communities in defining habitat types and evaluation of changes in the environment.

Set 4: Species interactions

The set includes: (1) the introduction to ecology of interspecific interactions and functional relations in natural assemblages, (2) types and characteristics of direct interactions, (3) multispecies interaction complex (indirect interactions, (4) influence of altered interspecific interaction on ecosystem function (5) problem of alien species introductions to natural ecosystems, invasion naturalization process of alien species and ecology of invasion steps and (6) coevolution of coexisting species (The Red-Queen Hypothesis), vključujoč koevolucijo patogenov in gostiteljev.

Set 5: Ecology of mycorrhiza

Student will receive detailed knowledge on ecological aspects of mycorrhizal interactions that will include: i) formation and characteristics of mycorrhizal interactions in different climatic zones and ecosystems; ii) importance of mycorrhizal interactions at the level od plant and fungal communities, and iii) potential effects of climatic changes on the formation and function of mycorrhizal interactions. Students will also be introduced to the contemporary techiques applied the this field of research (metagenomes, artificial inteligence).

Set 6: Functional Biodiversity

Review of function of biodiversity in terrestrial ecosystems. Evolutionary base of animal population functions in land ecosystems. Function of some animal group ((Lumbricidae, Chilopoda; Mammalia) in some key ecosystem processes. Including of these groups in ecosystems management. Their endangerment and conservation in human dominated landscape.

ekosistemov in vrst, spremembe količine vode, klimatske spremembe, fragmentacija habitata, tujerodne vrste. (2) Ugotavljanje soodvisnosti med okoljskimi spremembami in združbami organizmov v vodnih ekosistemih; vrste odzivov združb na spremembe, primerjava odzivov med različnimi združbami v istem okolju, primerjava odzivov med podobnimi združbami v različnih okoljih; spremembe v pestrosti, sestavi, delovanju; merjenje odzivov z različnimi orodji, interpretacija odzivov. (3) Vrednotenje okoljskih sprememb in ekološkega stanja vodnih ekosistemov: tipologija voda; metode primerjave združb in klasifikacija; za tip okolja značilna združba, izhodiščno (referenčno) stanje značilne združbe, merjenje odstopanja od izhodiščnega stanja (razmerje ekološke kakovosti), razvoj indeksov; indikatorske vrste v združbi, primernost različnih združb vodnih organizmov za ugotavljanje vpliva okoljskih spremembe, negotovosti pri vrednotenju ekološkega stanja. **Sklop 8: Sistemska biologija** Vsebinski sklop seznani študente s sistemsko ekologijo, ki sodi v širše področje ekologije ekosistemov. Sistemska ekologija s pomočjo splošne teorije sistemov in ekološkega modeliranja preučuje strukture in delovanje ekosistema na ravneh višjih od osebka ali vrste. Sklop sestajajo tri vsebinska področja: ekosistemska teorija, koncepti modeliranja in uporaba orodij za modeliranje na izbranih študijskih primerih. **Sklop 9: Molekularna ekologija** Predstavljeno bo področje molekularne ekologije in ogromen potencial, ki ga ima za ekološke raziskave. Preko primerov iz realnega sveta bodo študentje spoznavali sodobne molekularno-ekološke metode: ocenjevanje velikosti populacij z neinvazivnim genetskim vzorčenjem, prepoznavanje prostorske strukturiranosti in migracij iz prostorske razporeditve genotipov, uporabo genetike razumevanje razvoja kvantitativnih lastnosti in oceno biotske pestrosti s pomočjo DNA črtnih kod. Pojasnjena bo povezava med genetsko pestrostjo in sposobnostjo populacije/vrste, da obstane, genetsko ozadje viabilnosti populacij in problemi, ki spremljajo male populacije.	**Set 7: Freshwater ecology** Sed inclides the following topics: (1) Natural and anthropogenic changes in the aquatic ecosystems and their catchments: habitat change, pollution, land use, excessive exploitation of ecosystems and species, changes in water quantity, climate change, fragmentation of habitats, alien species. (2) Establishing relationship between environmental changes and assemblages in aquatic ecosystems; species responses of assemblages to environmental change, comparison of responses between different assemblages in the same environment, comparison of responses between similar assemblages in different environments; changes in diversity, composition, functioning; measuring responses with different tools, interpretation of responses. (3) Assessing environmental changes and ecological status of aquatic ecosystems: typology of aquatic ecosystems; methods of assemblages comparison and classifications; type specific assemblages, reference state of a type-specific assemblage, development of assessment indices, indicative species, measuring deviation from the reference state (relations of ecological quality) as well as appropriateness of varied aquatic assemblages to assess the impact of the environmental changes, uncertainty at the ecological status assessment. **Set 8: Systems ecology** This part of the course is designed to introduce students to systems ecology which is a branch of ecosystem ecology. Systems ecology attempts to clarify the structures and functions of ecosystems by investigations at the levels beyond that of the individual and species through the application of general system theory and ecological modelling. The course consists of three main topics: ecosystem theory, concepts and modelling theory and application of modelling tools to selected case studies. **Set 9: Molecular ecology** We will introduce the field of molecular ecology and its enormous potential for ecological research. We will use real-world examples to introduce the students to modern molecular-ecology methods: population size estimates through noninvasive genetic sampling, recognition of spatial structuring and migration from distribution of genotypes, use genetics to understand development of quantitative traits and genetic barcoding to assess biodiversity. We will explain the relation between genetic diversity and survival of a population/species, genetic background of population viability and the problems that plague small populations.

Temeljna literatura in viri/Readings:

Funkcionalna ekologija rastlin/ Functional plant ecology

Larcher, W., 2003. Physiological Plant Ecology. 513 pages, Springer, 4 edition, ISBN: 3540435166
Schulze, E.-D., Beck, E., Müller-Hohenstein, K., 2006. Plant Ecology. Springer, Berlin, Heidelberg, New York, 680 pages. ISBN: 354020833

Dusenge, M.E., Duarte, A.G., Way, D.A., 2019. Plant carbon metabolism and climate change: elevated CO2 and temperature impacts on photosynthesis, photorespiration and respiration. New Phytol, 221: 32-49.
Quijas, S., Schmid, B., Balvaneraž, P. 2010. Plant diversity enhances provision of ecosystem services: A new synthesis. Basic and Applied Ecology Basic and Applied Ecology 11 (2010) 582–592010,DOI: 10.1016/j.baae.2010.06.009
Weiskopf, S.R., Myers, B.J.E., Arce-Plata, M.I., Blanchard, J.L., Ferrier, S., Fulton, E.A., Harfoot, M., Isbell, F., Johnson, J.A., Mori, A.S., Weng, E., Harmáčková, Z.V., Londoño-Murcia, M.C., Miller, B.W., Pereira, L.M., Rosa, I.M.D., 2022. A Conceptual Framework to Integrate Biodiversity, Ecosystem Function, and Ecosystem Service Models BioScience,72, 11, 1062–1073. https://doi.org/10.1093/biosci/biac074
Revijalni članki s področja, tekoča periodika ter druga učna gradiva

Ekologija vodnih rastlin / Ecology of aquatic plants

Falkowski, P.G., and Raven, J.A. 2007. Aquatic photosynthesis. Princeton University Press, ISBN -10: 0-691-11551-6, str. 1-201, 319-364.
Germ, M., 2013. Biologija vodnih rastlin: učbenik. Ljubljana: samozal.. 78 str., ISBN 978-961-276-921-5.
Priporočena literatura: Dodds W. K. in M.R. Whiles, 2020. Freshwater Ecology Concept and environmental applications of limnology. Third Edition. Academic press, Elsevier. 981 pages. ISBN: 978-0-12-813255-5
Članek: Zelnik, I., Kuhar, U., Holcar, M., Germ, M., Gaberščik, A. Distribution of vascular plant communities in Slovenian watercourses. *Water*. 2021, 8, 13, 1-26,. https://www.mdpi.com/2073-4441/13/8/1071, DOI: 10.3390/w13081071.
Revija/Journal: Aquatic Botany, Elsevier.
Ter ostali aktualni znanstveni članki s področja Ekologije vodnih rastlin.

Vegetacija / Vegetation

Čarni, A. 2019. Pregled gozdnih združb Slovenije, Univerzitetna založba Univerze v Mariboru..
Maarel van der, E., Franklin, J., 2013. Vegetation ecology. John Wiley & Sons, Chichester.
Revija/Journal: Journal of Vegetation Science, Wiley

Medvrstni odnosi / Species interactions

Begon, M., C. R. Townsend, Harper, J. L., 2006. Ecology. Blackwell Publishing, Oxford.
Kryštufek, B., 1999. Osnove varstvene biologije. Tehniška založba Slovenije, Ljubljana.
Lockwood, J. L., Hoopes, M. F., Marchetti, M. P., 2007. Invasion Ecology. Blackwell Publishing, Oxford.
Tome, D., 2006. Ekologija: organizmi v prostoru in času. Tehniška založba Slovenije, Ljubljana.
Tscharntke, T., Hawkins, B.A., 2002. Multitrophic Level Interactions. Cambridge University Press, Cambridge.
Canning-Clode, J., ed., 2015. Biological Invasions in Changing Ecosystems. De Gruyter Open, eBook.
Dhondt, A. A. (2012). Interspecific competition in birds. Oxford Avian Biology.

Ekologija mikorize / Ecology of mycorrhiza

Shah MA (2014) Mycorrhizas: Novel Dimensions in the Changing World, Springer, Berlin
Solanki, M. K., Kashyap, P. L., Kumari, B. (2020) Phytobiomes: Current Insights and Future Vistas, Elsevier
Smith, S. E. (2008) Mycorrhizal symbiosis, Academic Press
Revija/Journal: Mycorrhiza, Springer

Funkcionalna biodiverziteta / Functional Biodiversity

Begon, M., C. R. Townsend, Harper, J. L., 2021. Ecology : from individuals to ecosystems Blackwell Publishing, Oxford.
https://plus.cobiss.net/cobiss/si/sl/bib/bfbnib/60276483
Loreau, M., Naeem, S., Inchausti, P. (Eds), 2002. Biodiversity and Ecosystem Functioning: Synthesis and Perspectives. Oxford University Press, Oxford.
Aktualna revijalna literatura

Ekologija celinskih voda / Freshwater ecology

Priporočena literatura: Moss, B. 2018. Ecology of Freshwaters. Earth's Bloodstream. 5th Edition. Wiley.
Allan, J.D., Castillo, M.M., 2007. Stream Ecology: Structure and Function of Running Waters, 2nd Ed. Springer.
Legendre, P., Legendre, L., 1998. Numerical Ecology. 2nd Ed. Elsevier Science
Revija/Journal: aktualni znanstveni članki na tem področju

Sistemska ekologija / Systems ecology

Jorgensen, S.E., 2007. A new ecology: systems perspective (1st ed., str. XI, 275). Amsterdam [etc.].
Nielsen, S. N., Fath, B.D., Bastianoni, S., Marques, J. C., Müller, F., Patten, B.C., Ulanowicz, R.E., Jørgensen, S.E., Tiezzi, E., (Eds.) 2020 A New Ecology (Second Edition), Elsevier. – priporočena literatura

Jorgensen, S.E., 2012. Introduction to Systems Ecology (Applied Ecology and Environmental Management). CRC Press. – priporočena literatura
Jørgensen, S.E., Fath, B.D., 2011. Fundamentals of Ecological Modelling : Applications in Environmental Management and Research. Developments in Environmental Modelling. Amsterdam [etc.]: Elsevier.
Molekularna ekologija / Molecular ecology
Frankham, Richard, Jonathan D. Ballou, and David A. Briscoe. A primer of conservation genetics. Cambridge University Press, 2004.
Revije/Journals: Molecular Ecology, Conservation Genetics
Pri vseh sklopih tudi revijalni članki s področja, tekoča periodika ter druga učna gradiva / In all sets also scientific articles in the field of ecology, current periodicals and other learning materials

Cilji in kompetence:	**Objectives and competences:**
Sklop 1: Funkcionalna ekologija rastlin Poznavanje prilagoditev rastlin v različnih okoljih. Zavedenje, da specifične funkcionalne poteze rastlin omogočajo optimizacijo privzema energije in kroženja snovi v ekosistemih, vsakršne motnje pa to učinkovitost zmanjšajo, kar se odraža v slabšanju delovanja ekosistema. Zavedanje medsebojne povezanosti med rastlinami in okoljem, kot osnove za trajnostno gospodarjenje z rastlinskimi viri (kmetijstvo, gozdarstvo). Poznavanje možnosti uporabe rastlin za blaženje sprememb v okolju. **Sklop 2: Ekologija vodnih rastlin** Prepoznavanje bioindikacijske vloge makrofitov in invazivnega potenicala tujerodnih vodnih rastlin. Posredovati študentom najnovejše znanje na področju sposobnosti vodnih rastlin, za privzem selena ter jih seznaniti z pomenom silicija za vodne rastline. Seznaniti študente o vplivu globalnih sprememb na vodne ekosisteme. **Sklop 3: Vegetacija** Vedenje, da vegetacija predstavlja rastlinsko komponento biosfere, ki jo gradijo posamezne rastlinske združbe in so tako osnovni del večine kopenskih ekosistemov. Ti pa so deli krajin, tako naravnih kot kulturnih, ki predstavljajo okolje, v katerem živijo živa bitja. Poznavanje vegetacije nam pomaga razumeti krajine, hkrati pa je tudi okolja za živa bitja, ki jo soustvarjajo**.** **Sklop 4: Medvrstni odnosi** Razvoj kritičnega pogleda na razumevanje delovanja ekosistemov, evolucije in vidikov ekosistemskega varstva z vidika biotskih odnosov. Posebej izpostavljena je problematika tujerodnih vrst, ki so danes pomemben okoljskih dejavnik s stališča varstva ekosistemov in ekonomskega izkoriščanja naravnih virov. Predmet je nadgradnja osnovnih ekoloških principov zgradbe in delovanja ekosistema s poudarkom na razumevanju biotskega okoljskega dejavnika, ki je razdelan tako iz temeljnih kot aplikativnih vidikov. **Sklop 5: Ekologija mikorize** Študent bo osvojil ekološke aspekte mikoriznih interacij, s čimer bo sposoben lastnega načrtovanja in opravljanja raziskav na tem raziskovalnem področju. V ta namen bo študent tudi seznanjen z modernimi metodami raziskovanja mikoriznih interakcij	**Set 1: Functional plant ecology** Knowledge on plant adaptations in different environments. The awareness that specific functional plant traits optimize the input of energy and cyclyng of matter in the ecosystems and that any disturbance or pressure affect efficiency and result disturbances in ecosystem functioning. The awareness of inter-relations between plants and environment as a basis for sustainable management of plants and ecosystems (agriculture, forestry). The knowledge on the use of plants for alleviation of changes in the environment. **Set 2: Ecology of aquatic plants** Acquaintance with the latest literature on the role of macrophytes as biondicators and the invasive potential of allien species. To provide students with the latest knowledge in the field of the ability of water plants, to uptake of selenium. and knowledge of the metabolism of selenium. To acquaint students with the importance of silicon for aquatic plants. To acquaint students with the impact of global changes on aquatic ecosystems. **Set 3: Vegetation** The knowledge about vegetation as a component of the biosphere built by plant communities and is one of the basic part of most terrestrial ecosystems. These are parts of the landscape, both natural and cultural, which constitute the environment in which appear living beings. Knowledge of vegetation helps us understand the landscape, but also the environment of living beings, who (co-)create it. **Set 4: Species interactions** The development of critical thinking about ecosystem functioning, evolution and ecosystem conservation in regard to biotic interactions. As a key example the problem of invasive alien species is set, which are recently one the most important environmental problems on the field of ecosystem conservation and economic exploitation of natural resources. The subject is aimed to enhance basic knowledge on ecological principles regarding ecosystem structure and function regarding biotic environmental factors from the basic and applicative points of view. **Set 5: Ecology of mycorrhiza** Students will acquire knowledge and skills for work with mycorrhizas. This will enable them to plan and

(metagenomi, umetna inteligenca), s čimer bo pridobil kritičen pogled na trenutno stanje raziskav na tej tematiki. **Sklop 6: Funkcionalna biodiverziteta** Seznaniti študente z novimi spoznanji o funkcijski vlogi raznolikosti življenja, razumevanje evolucijskega izhodišča razvoja biote in funkcionalnih ekosistemov. Utrditi pomen znanja pri trajnostnem upravljanju kopenskih ekosistemov. Prepoznati grožnje biodiverziteti in razviti sposobnost za iskanje ustreznih rešitev za njeno varstvo. **Sklop 7: Ekologija celinskih voda** Temeljni izobraževalni cilji so: (1) razumevanje odziva vodnih ekosistemov na naravne in antropogeno povzročene spremembe v okolju, (2) poznavanje najnovejših metod vrednotenja ekološkega stanja vodnih ekosistemov na podlagi združb organizmov, (3) razumevanje ekosistemskega pristopa pri upravljanju voda. **Sklop 8: Sistemska biologija** Cilj tega sklopa predmeta je podati znanje o sistemsko-ekološke značilnostih strukture in delovanja ekosistema za potrebe njegovega razumevanja, napovedovanja njegovega obnašanja in upravljanja z njim. **Sklop 9: Molekularna ekologija** Omogočiti študentom vpogled v hitro razvijajoče področje molekularne ekologije. Predstaviti najsodobnejše raziskovalne metode, ki zadnja desetletja premikajo meje izvedljivosti ekoloških raziskav.	to carry out research in the field of ecology of mycorrhiza. With this in mind, student will be introduced to the current state of the art in the reasearch t.i. metagenomes, artificial inteligence, which will enable critical thinking about these technique and the current state of this research field. **Set 6: Functional Biodiversity** Acquaintance of students with the latest knowledge on the role of biodiversity, to understanding of evolutionary base of biota development and development of functional ecosystems. To improve the important of science knowledge into sustainable management of land ecosystems. To be able to identified treats to biodiversity and found adequate solutions for their conservation. **Set 7: Freshwater ecology** Basic educational aims: (1) understanding the response of aquatic ecosystems on natural and anthropogenic environmental changes, (2) knowing of the most recent methods of community-based ecological status assessment methods of aquatic ecosystems, (3)understanding of the ecosystem approach in the water management. **Sklop 8: Systems ecology** The aim this part of the course is to provide systems approach to the knowledge about the characteristics of the structure and functioning of the ecosystem for the purpose of explanations, predictions and management. **Set 9: Molecular ecology** To provide the students with the first glimpse into the rapidly developing field of molecular ecology. To introduce the modern research methods that have been fort the last couple of decades redefining the limits of what can be done in ecological research.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Sklop 1: Funkcionalna ekologija rastlin Študenti spoznajo odzive rastlin na okoljske dejavnike in njihovo vlogo pri preoblikovanju in vzdrževanju stanja okolja. Razumejo pomen plastičnosti rastlinskega odziva v različnih okoljih in njegovo razvrednotenje ob "nepričakovanih" spremembah. Seznanijo se z optimiziranostjo strukture in funkcije rastline kot dela kompleksnega sistema. **Sklop 2: Ekologija vodnih rastlin** Študenti bodo prepoznali vlogo vodnih rastlin v ekosistemu, lastnosti vodnih rastlin kot bioindikatorjev. Študenti bodo poznali najpogosteje invazivne tujerodne vodne rastline in njihov invazivni potencial in grožnjo za domorodno floro. Seznanjeni bodo z najnovejšimi izsledki o sposobnost vodnih rastlin za privzem selena. Študenti bodo spoznali pomen silicija za vodne rastline. Študenti bodo spoznali možne vplive globalnih sprememb na vodne ekosisteme s poudarkom na vodnih rastlinah. **Sklop 3: Vegetacija**	**Set 1: Functional plant ecology** The students gain understanding on responses of plants to environmental factors and their role in shaping and maintenance favourable environmental conditions. They get acquainted with the plasticity of plant response in different environment and its deterioration due to unexpected changes. They are aware of the optimization of the structure and function of plants as a part of the complex system. **Set 2: Ecology of aquatic plants** Students will recognise the role of aquatic plants in ecosystem, and the characteristics of aquatic plants as bioindicators. Students will be familiar with the most common invasive non-native aquatic plants and their invasive potential and threat to native flora.They will learn about the latest findings on the ability of aquatic plants to uptake of selenium.. Students will learn about the importance of silicon for aquatic plants. Students will learn about the possible impacts of global changes on aquatic ecosystems, emphasising aquatic plants.

Študenti se bodo seznanili s sodobnimi pristopi pri preučevanju vegetacije, ki jim bodo omogočili raziskovanje na tem področju in rezultatov poznavanja, ki jih je mogoče s to metodologijo doseči. Poleg tega pa se bodo seznanili z možnostmi, ki jih vegetacijske raziskave vegetacije ponujajo pri opredelitvi okolja posameznih živih bitij oz. za razumevanje krajine kot celote. **Sklop 4: Medvrstni odnosi** Predmet je zasnovan tako, da vzpodbuja slušatelje k raziskovalnemu razmišljanju na področju raziskav medvrstnih odnosov in njihove vpetosti v različna področja ekosistemskih raziskav. Ob tem bodo sposobni vidike biotskih interakcij vključevati v različna raziskovalna vprašanja pri uporabnih in temeljnih raziskavah, kar vzpodbuja k koncipiranju večje kompleksnosti reševanja raziskovalnih problemov. **Sklop 5: Ekologija mikorize** Razumevanje delovanja mikoriznih interakcij, Poznavanje razporeditev mikoriznih interakcij v različnih klimatskih pasovih in ekosistemih, Pomen mikoriznih interakcij na nivoju združb, Potencialne spremembe v pojavljanju in delovanju mikoriznih interakcij zaradi klimatskih.spememb **Sklop 6: Funkcionalna biodiverziteta** Razumevanje razvoja biodiverzitete in njene vloge v delovanju ekosistemov. Izpopolnitev znanja o funkcijski vlogi nekaterih živalskih skupinah v kopenskih ekosistemih. Povezati različna biološka znanja v uporabno celoto kot osnova holističnem pristopu k trajnostnem upravljanju z okoljem. Poznavanje dejavnikov ogrožanja kopenske biodiverzitete ter načini varstvenega ukrepanja. **Sklop 7: Ekologija celinskih voda** Predvideni študijski rezultat je kandidata usposobiti za delo z obravnavanimi metodami in orodji, ki jih bo kandidat lahko uporabljal pri temeljnih in aplikativnih raziskavah združb vodnih ekosistemov in njihovem upravljanju. **Sklop 8: Sistemska biologija** Slušatelji bodo pridobili metodološka znanja, ki jim bodo omogočala pridobivanje novih znanj o obnašanju preučevanega ekosistema, znali bodo napovedati njegovo obnašanje in strukturirati pridobljene znanje v obliko primerno za upravljanje ekosistemov. **Sklop 9: Molekularna ekologija** Študentje bodo dobili vpogled v področje molekularne ekologije in možnosti, ki jih ponuja. Dobili bodo pregled sodobnih raziskovalnih molekularno-ekoloških metod in rešitev, ki jih ponujajo. Na ta način bodo razširili svojo paleto poznavanja raziskovalnih orodij, ki jih bodo lahko z dodatnim študijem s pridom uporabili pri svojem raziskovalnem delu.	**Set 3: Vegetation** Students will become familiar with contemporary approaches to the study of vegetation that will allow them to reseach in this field and possible results achieved with this methodology. In addition, they will learn about the possibilities available to the vegetation surveys to provide the designation of the environment of the individual living beings and for understanding of the landscape as a whole. **Set 4: Species interactions** Students will be stimulated to research thinking at the field of studies of interspecific interactions and there interconnection at different levels of ecosystem research. An important issue is that students will be able to include different interspecific interaction aspects into formation of scientific questions in applicative as well as basic studies in order to incorporate greater complexity approach into research problem solutions. **Set 5: Ecology of mycorrhiza** Understanding of functioning of mycorrhizal interactions and their distribution across different climate zones and ecosystems. Awareness of the importance of mycorrhizal interactions on community level, Potential impact of climate changes on the formation and functioning of mycorrhizal interactions **Set 6: Functional Biodiversity** The students gain understanding about the development of biodiversity and the role of diversity for ecosystem function. They will complete their knowledge on function of some animal groups in terrestrial ecosystems. They will integrate biological knowledge that will enable them to understand holistic approach in sustainable environment management. They will gain knowledge on factors with negative influence on conservation status of biodiversity and possible effective meassures for its conservation. **Set 7: Freshwater ecology** The envisaged learning outcome is to qualify a candidate for work with the methods and tools dealt with, which the candidate can use in basic and applicative research of aquatic ecosystems and their management. **Set 8: Systems ecology** Students will obtain methodological skills that will allow them to acquire new knowledge about the behavior of the studied ecosystems, they will be able to predict its behavior and to structure the acquired knowledge into a form suitable for the management of ecosystems. **Set 9: Molecular ecology** The students will gain an insight into the field of molecular ecology and the opportunities it provides. They will get an overview of modern research methods and the solutions they offer. In this manner they will extend their knowledge of research tools.

	With additional study they will be able to utilize this knowledge in their own research.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanje, konzultacije, seminar, razprava	Lectures, consultations, seminar, discussion

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Izpit	50,00 %	The examination
Seminar	50,00 %	Seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

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EKOLOGIJA IN BIODIVERZITETA GLIV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ekologija in biodiverziteta gliv
Course title:	Fungal ecology and biodiversity
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0566749
Koda učne enote na članici/UL Member course code:	0

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	10	10	0	15	80	5

Nosilec predmeta/Lecturer:	Nina Gunde Cimerman

Izvajalci predavanj:	Cene Gostinčar, Nina Gunde Cimerman, Polona Zalar
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij	Fullfillement of general conditions required for graduate study

Vsebina:	**Content (Syllabus outline):**
Vzorci biološke raznovrstnosti gliv	Fungal biodiversity patterns
Metode za ločitev taksonov, zasledovanje vrst, in ocenjevanje raznovrstnosti	Methods for discriminating taxa, monitoring species and assesing fungal diversity
Saprofitske glive	Saprobic fungi
Endofitske glive	Endophytic fungi
Glive v stresnih okoljih	Fungi in stressful environments
Glive v povezavi z živalmi	Fungi associated to animals

Temeljna literatura in viri/Readings:

1. G. M. Mueller, G.F.Bills, M.S.Foster: Biodiversity of Fungi. Inventory and monitoring methods. Elsevier Academic press, 2004, pp. 777.
2. B. Kendrick. Fifth Kingdom. Hackett Publishing Co., 2017, pp.491.

Revijalni članki s področja, tekoča periodika, druga učna gradiva**. /**
Environmental Analytical Chemistry, Ed. F.W. Fifield, P.J. Haines, Blackwell Science, 2000,
Izbrana poglavja/Selected chapters: D. A Skoog, , F. J. Holler, S. R. Crouch, Principles of Instrumental Analysis, Thomson, 2007.
članki v znanstveni in strokovni periodiki s področja analizne kemije,
papers in scientific journals related to analytical chemistry

Cilji in kompetence:	**Objectives and competences:**
Pridobitev temeljnega znanja za osamitev, karakterizacijo, identifikacijo in shranjevanje gliv. Temelji za razumevanje ekologije gliv.	Basic knowledge for isolation, characterisation, identification and preservation of fungi. Basics for understanding fungal ecology .

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent spozna in razume osnovne koncepte in teorijo vloge gliv v okolju, od saprotrofnih do patogenih, simbiontskih in parazitskih interakcij, raznovrstnost glivnih združb v različnih mezofilnih in pa tudi ekstremnih okoljih. Študent se nauči zasnovati in izvesti eksperimente s področja glivne ekologije in spozna ustrezne ekološke metode in pristope za ocenjevanje diverzitete.	Knowledge and understanding: Students will learn and understand the basic concepts and theory regarding the role of fungi in the environment, from saprotrophic to symbiotic, pathogenic and parasitic interactions, the diversity of fungal communities in different mesophilic, as well as extreme environments. Students will learn how to plan and perform experiments within the field of fungal ecology. They will learn about the most suitable ecological methods and approaches for evaluating fungal biodiversity.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, individualne konzultacije	Lectures, seminars, individual consultations

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Teoretični pisni izpit. Pozitivna ocena 51%	100,00 %	Theoretical written exam. Positive grade 51%.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Nina Gunde-Cimerman

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2. GOSTINČAR, Cene, TURK, Martina, ZAJC, Janja, GUNDE-CIMERMAN, Nina. Fifty Aureobasidium pullulans genomes reveal a recombining polyextremotolerant generalist. Environmental microbiology, ISSN 1462-2912. [Print ed.], 2019, vol. 21, iss. 10, str. 3638-3652. https://doi.org/10.1111/1462-2920.14693, doi: 10.1111/1462-2920.14693. [COBISS.SI-ID 5158991]

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4. PERINI, Laura, ANDREJAŠIČ, Kristina, GOSTINČAR, Cene, GUNDE-CIMERMAN, Nina, **ZALAR, Polona**. Greenland and Svalbard glaciers host unknown basidiomycetes: the yeast Camptobasidium arcticum sp. nov. and the dimorphic Psychromyces glacialis gen. and sp. nov. International journal of systematic and evolutionary microbiology. 27 Jan. 2021, vol. 71, iss. 2, str. 1-17, ilustr. ISSN 1466-5034. https://www.microbiologyresearch.org/content/journal/ijsem/10.1099/ijsem.0.004655, DOI: 10.1099/ijsem.0.004655. [COBISS.SI-ID 50481155].
5. GOSTINČAR, Cene, **ZALAR, Polona**, GUNDE-CIMERMAN, Nina. No need for speed : slow development of fungi in extreme environments. Fungal biology reviews. 2022, vol. 39, 1-14. ISSN 1749-4613. https://www.sciencedirect.com/science/article/pii/S1749461321000543?via%3Dihub, DOI: 10.1016/j.fbr.2021.11.002. [COBISS.SI-ID 103798787].
6. EL BAIDOURI, Fouad, **ZALAR, Polona**, JAMES, Timothy Y., GLADFELTER, Amy S., AMEND, Anthony S. Evolution and physiology of amphibious yeasts. Annual review of microbiology. 2021, vol. 75, str. 337-357, ilustr. ISSN 1545-3251. https://www.annualreviews.org/doi/10.1146/annurev-micro-051421-121352, DOI: 10.1146/annurev-micro-051421-121352. [COBISS.SI-ID 81767171].

EKOLOŠKI INŽENIRING

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ekološki inženiring
Course title:	Ecological engineering
Članica nosilka/UL Member:	UL ZF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037269
Koda učne enote na članici/UL Member course code:	3771

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	15	10	0	0	90	5

Nosilec predmeta/Lecturer:	Tjaša Griessler Bulc

Izvajalci predavanj:	Tjaša Griessler Bulc
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Ekološki inženiring (sonaravne rešitve, zelene tehnologije, vključujoč trajnostne stavbe, urbano kmetijstvo, okolju prijazne tehnologije v konceptih mest in vasi prihodnosti, ekosistemske storitve; ekonomski vidik za povečevanje kvalitete bivanja človeka-well being).	Ecological engineering (nature-based solution, green technologies, including sustainable buildings, urban agriculture, green technology concepts in the towns and villages of the future, economic aspect for increasing the quality of living humans – well being).

Temeljna literatura in viri/Readings:

1. Somarakis, G., Stagakis, S., & Chrysoulakis, N. (Eds.). (2019). Thinknature Nature-Based Solutions Handbook. ThinkNature project funded by the EU Horizon 2020 research and innovation programme (str. 25-117). 2. Beyond water quality-Sewage treatment in a circular economy (2022), EEA Report No. 05/2022, European Environment Agency, Luxembourg: Publications Office of the European Union (str. 15-41). 3. Oral, H. De Carvalho, L. P., Gajewska, M., Ursino, N. et al. A review of nature-based solutions for urban water management in European circular cities - a critical assessment based on case studies and literature. *Blue-green systems*. jan. 2020, št. 1, letn. 2, str. 112-136, ilustr. ISSN 2617-4782. https://iwaponline.com/bgs/article/doi/10.2166/bgs.2020.932/71868/A-review-of-nature-based-solutions-for-urban-water, DOI: 10.2166/bgs.2020.932. [COBISS.SI-ID 9075553] 4. Castellar, J. A. C., Atanasova, N., Langergraber, G., Acuña, V. et al. Nature-based solutions in the urban context - terminology, classification and scoring for urban challenges and ecosystem services. *Science of the total environment*. jul. 2021, letn. 779/146237, str. 1-13, ilustr. ISSN 0048-9697. https://doi.org/10.1016/j.scitotenv.2021.146237, DOI: 10.1016/j.scitotenv.2021.146237. [COBISS.SI-ID 57949187] financer: EC, 776665, Integrating Edible City Solutions for social resilient and sustainably productive cities, EdiCitNet Znanstveni članki na tem področju / state of the art papers.

Cilji in kompetence:	**Objectives and competences:**
Poznavanje novosti na področju ekološkega inženirstva, ekosistemskih storitev, sprememb procesov v ekosistemih pod vplivom onesnaževanja in uporabe ekotehnologij pri ohranjanju ekološkega ravnotežja v naravi.	Knowledge on recent advances in environmental engineering, ecosystem services, changes in ecosystem processes under the influence of pollution and in application of eco-technology in maintaining ecological balance in nature.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Razumevanje delovanja ekotehnologij (ekoremediacije, rastlinske čistilne naprave, druge zelene teh.; blažilna območja, zelene strehe, vertikalni vrtovi). Razumevanje postopkov sanacij v okolju z uporabo ekotehnologij.	Understanding of eco-technologies (ERM, wetlands, other green techol., buffer zones, green roofs, vertical gardens). Understanding the processes of remediation in the environment by using eco-technologies.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Individualno delo na projektih • Predstavitve in interpretacije rezultatov projektov ostalim študentom v skupini v seminarski obliki • Diskusija o objavljenih člankih iz izbranih tem (kritično vrednotenje znanstvene literature, predstavitev »case studies«)	• lectures • Individual project work • Presentation and interpretation of results of project work to the other students in open discussion • Journal club – discussion of published research articles on selected topics (critical evaluation of scientific literature, presentation of the "case studies")

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Preverjanje znanja poteka v obliki projektne naloge na realnih primerih iz raziskovalne prakse, v kateri študentje pripravijo rešitve za izbrani predlog raziskovalnega projekta. Projektne naloge oddajo v pisni obliki in jih zagovarjajo v ustni obliki, v diskusiji z nosilcem predmeta in sodelujočimi profesorji ter ostalimi študenti.	50,00 %	During the course students prepare individual projects of real cases from research practice, where students prepare solutions for determined research project proposal. They prepare final project work and defend it in the classroom in discusion with professors and other students.
Študent pripravi tudi seminar iz tematike doktorata v povezavi z eno od vsebin	50,00 %	Student prepares a doctoral seminar on the topic related to one of the course. In this

predmeta. Pri tem sodelujeta mentor in nosilec predmeta oz. drugi izvajalci predmeta. Zagovor opravlja študent pred mentorjem in nosilcem in/ali drugim izvajalcem.		cooperate menthor and lecturer or/and other professors. Student defend the seminar in front of mentor and lecturer and/or other professors.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Tjaša Griessler-Bulc

ŠKUFCA, David, PROSENC, Franja**, GRIESSLER BULC, Tjaša**, HEATH, Ester. Removal and fate of 18 bisphenols in lab-scale algal bioreactors. *Science of the total environment*. Jan. 2022, vol. 804, str. 149878-1-149878-9, graf. prikazi. ISSN 0048-9697. https://www.sciencedirect.com/science/article/pii/S0048969721049536, DOI: 10.1016/j.scitotenv.2021.149878. [COBISS.SI-ID 74097923]

LANGERGRABER, Günter, CASTELLAR, Joana A. C., ANDERSEN, Theis Raaschou, ANDREUCCI, Maria-Beatrice, BAGANZ, Gösta F. M., BUTTIGLIERI, Gianluigi, CANET-MARTÍ, Alba, CARVALHO, Pedro, FINGER, David Christian, **GRIESSLER BULC, Tjaša**, JUNGE-BERBEROVIC, Ranka, MEGYESI, Boldizsár, MILOŠEVIĆ, Dragan, ORAL, Hasan Volkan, PEARLMUTTER, David, PINEDA-MARTOS, Rocío, PUCHER, Bernhard, VAN HULLEBUSCH, Eric D., ATANASOVA, Nataša. Towards a cross-sectoral view of nature-based solutions for enabling circular cities. *Water*. 2021, vol. 13, iss. 17, str. 1-19, ilustr. ISSN 2073-4441. https://www.mdpi.com/2073-4441/13/17/2352, DOI: 10.3390/w13172352. [COBISS.SI-ID 80079875]

VAN HULLEBUSCH, Eric D., BANI, Aida, CARVALHO, Miguel, CETECIOGLU, Zeynep, DE GUSSEME, Bart, DI LONARDO, Sara, DJOLIC, Maja, VAN EEKERT, Miriam, **GRIESSLER BULC, Tjaša**, HAZNEDAROGLU, Berat Z., ISTENIČ, Darja, KISSER, Johannes, KRZEMINSKI, Pawel, MELITA, Sanna, PAVLOVA, Dolja, PŁAZA, Elżbieta, SCHOENBORN, Andreas, THOMAS, Geraldine, VACCARI, Mentore, WIRTH, Maria, HARTL, Marco, ZEEMAN, Grietje. Nature-based units as building blocks for resource recovery systems in cities. *Water*. 2021, vol. 13, iss. 22, str. 1-52, ilustr. ISSN 2073-4441. https://www.mdpi.com/2073-4441/13/22/3153, DOI: 10.3390/w13223153. [COBISS.SI-ID 84887555]

PROSENC, Franja, PIECHOCKA, Justyna, ŠKUFCA, David, HEATH, Ester, **GRIESSLER BULC, Tjaša**, ISTENIČ, Darja, BUTTIGLIERI, Gianluigi. Microalgae-based removal of contaminants of emerging concern : mechanisms in Chlorella vulgaris and mixed algal-bacterial cultures. *Journal of hazardous materials*. [Print ed.]. 2021, vol. 418, str. 126284-1-126284-11. ISSN 0304-3894. DOI: 10.1016/j.jhazmat.2021.126284. [COBISS.SI-ID 66314499]

KISSER, Johannes, WIRTH, Maria, DE GUSSEME, Bart, VAN EEKERT, Miriam, ZEEMAN, Grietje, SCHOENBORN, Andreas, VINNERÅS, Björn, FINGER, David Christian, KOLBL REPINC, Sabina, **GRIESSLER BULC, Tjaša**, BANI, Aida, PAVLOVA, Dolja, STAICU, Lucian C., ATASOY, Merve, CETECIOGLU, Zeynep, KOKKO, Marika, HAZNEDAROGLU, Berat Z., HANSEN, Joachim, ISTENIČ, Darja, CANGA, Eriona, MALAMIS, Simos, CAMILLERI-FENECH, Margaret, BEESLEY, Luke, et al. A review of nature-based solutions for resource recovery in cities. *Blue-green systems*. jan. 2020, letn. 2, št. 1, str. 138-172, ilustr. ISSN 2617-4782. https://iwaponline.com/bgs/article/doi/10.2166/bgs.2020.930/72076/A-review-of-naturebased-solutions-for-resource, DOI: 10.2166/bgs.2020.930. [COBISS.SI-ID 9061473]

OARGA-MULEC, Andreea, JENSSEN, Petter D., KRIVOGRAD-KLEMENČIČ, Aleksandra, URŠIČ, Matej, **GRIESSLER BULC, Tjaša**. Zero-discharge solution for blackwater treatment at remote tourist facilities. *Journal of cleaner production*. [Print ed.]. Nov. 2017, vol. 166, str. 798-805, ilustr. ISSN 0959-6526. http://www.sciencedirect.com/science/article/pii/S0959652617317171, DOI: 10.1016/j.jclepro.2017.08.002. [COBISS.SI-ID 2312039]

EKONOMSKI IN SOCIOLOŠKI VIDIKI RAZVOJA PODEŽELJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ekonomski in sociološki vidiki razvoja podeželja
Course title:	Economic and sociological aspects of rural development
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037298
Koda učne enote na članici/UL Member course code:	3800

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	35	0	0	0	80	5

Nosilec predmeta/Lecturer:	Andrej Udovč

Izvajalci predavanj:	Majda Černič Istenič, Andrej Udovč
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies

Vsebina:	Content (Syllabus outline):
Vsebina predmeta poudarja značilnosti in probleme multifunkcionalnosti podeželja: razumevanje kompleksnosti podeželskega prostora in življenjskih praks njegovega prebivalstva, kar pogojuje vključevanje ekonomskih, sociooloških, kulturnih, prostorskih in ekoloških vidikov v razvoju podeželja: • Konceptualne osnove: modeli gospodarskega razvoja in njihova aplikacija v razvoju podeželja; alternativni pristopi k razvoju podeželja	The content of the course stresses the characteristics and problems of the multifunctionality of the rural areas: understanding the complexity of rural areas and life praxis of its inhabitants, what make it necessary to include economic, sociological, cultural, spatial and ecological views in the rural development: • Conceptual bases: models of economic development and their application in the development of the countryside; alternative

(eksogeni, endogeni); tipološke členitve podeželja in njihova uporabnost. • Strukturne spremembe na podeželju in diverzifikacija: dimenzije in dejavniki strukturnih sprememb v kmetijstvu; spreminjajoča se gospodarska in prostorska vloga podeželja; gospodarska diverzifikacija kot odgovor na strukturne spremembe. • Podeželje v sistemu gospodarskega razvojnega načrtovanja: razvoj podeželja in sektorske politike; razvoj podeželja in regionalni razvoj; razvoj podeželja in lokalne razvojne iniciative; kvalitativni in kvantitativni pristopi k vrednotenju razvojnih politik na podeželju. • Trajnostni razvoj in razvoj podeželja: koncept(i) trajnosti, vključitev načela trajnosti v model cirkularnega gospodarstva, okoljski vidiki razvoja podeželja (metode ekonomskega vrednotenja okoljskih učinkov, načela upravljanja z obnovljivimi naravnimi viri). • Prostorski vidiki razvoja podeželja: načela prostorskega načrtovanja v podeželskem prostoru; podeželje kot prostor potrošnje (consumption space); kompeticija med alternativnimi rabami podeželskega prostora; urejanje kmetijskih zemljišč z vidika trajnostnega ohranjanja večnamenskosti podeželskega prostora. • Sociološki in kulturni vidiki razvoja podeželja: razumevanje življenja podeželskega prebivalstva kot družbeno konstruirane realnosti; pojem socialne vključenosti in izključenosti na podeželju (revščina in porazdelitev dohodka, odnosi med družbenimi skupinami, odnosi med spoloma); potrebe, zaznave in interesi deležnikov v razvoju podeželja na mikro-, mezo- in makro ravni. • Posebni vidiki razvoja podeželja: • Trajnostna turistična in rekreacijska raba podeželskega prostora.	approaches to rural development (exogenic, endogenic); typological articulation of the countryside and its functionality. • Structural changes in the countryside and diversification: dimensions and factors of structural change in agriculture; changing economic and spatial role of the countryside; economic diversification as a response to structural change. • Rural areas in the system of economic development plans: development of rural areas and sectorial policies; development of rural areas and regional development; development of rural areas and local development initiatives; qualitative and quantitative approaches to assessing development policies in rural areas. • Sustainable development and development of rural areas: concept(s) of sustainability, inclusion of the principle of sustainability in the model of a circular economy, environmental aspects of rural development (methods of economic assessment of environmental impact, principle of managing renewable natural resources). • Spatial planning aspects of rural development: principle of spatial planning in the rural space; the countryside as a space of consumption; competition among alternative uses of rural space; regulating farmland from the point of view of multifunctionality of rural space. • Sociological and cultural aspects of rural development: understanding the life of the rural population as a socially constructed reality; concept of social inclusion and exclusion in rural areas; needs, feelings and interests of participants in rural development on micro-, mezzo- and macro-levels. • Specific aspects of rural development: - Sustainability of touristic and recreational use of the rural space.

Temeljna literatura in viri/Readings:

Temeljni viri in literatura:

OECD, 2006 The NEW rural paradigm : policies and governance. - Paris : OECD, 2006. - 164 str.

OECD, 2006. Coherence of agricultural and rural development policies (Diakosavvas, D, ed.). Paris, OECD, 2006, 415 str.

revijalni članki s področja, tekoča periodika, druga učna gradiva

Priporočena literatura:

Fulkerson Gregory M., Thomas Alexander R., eds. 2013. Studies in urbanormativity: Rural communities in urban society. Lanham, MD: Lexington Books. - 296 str. ISBN 978-0-7391-7877-5

Copus, A.K., Lima, P. de. 2015 Teritorial cohesion in rural Europe: the relational turn in rural development. New York, Routledge.- 278 str. ISBN 9781138363854

Moseley, M.J. 2003 Rural development: principles and Practices. SAGE, London,240 str. ISBN:0761947671

Cilji in kompetence:	**Objectives and competences:**
Študentje bodo spoznali metode, pristope, tehnike in koncepte, ki so vezani na raziskovanje in upravljanje multifunkcionalnosti podeželskega prostora. Cilj	The student qualify him or her in the use of methods, approaches, techniques and concepts connected with

predmeta je študente usposobiti za samostojno, uspešno in strokovno opravljanje nalog povezanih s proučevanjem socio-ekonomskih procesov, ter načrtovanjem in izvajanjem razvojnih programov na podeželju.	research and management of the multifunctionality of rural areas. The aim of the subject is to qualify the student for independent, successful and professional tasks connected with studying socio-economic processes and planning and implementing development programmes in rural areas.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Po zaključenih študijskih obveznostih študent pozna konceptualne osnove k pristopu razvoja podeželja, ter razume strukturne dejavnike razvoja, umestitev podeželja v gospodarski sistem, prostorski vidik podeželja, ter sociološki in kulturni vidik razvoja podeželja.	Knowledge and understanding: Upon completion of the course student knows the conceptual basis for an approach for rural development, and understands the structural factors of development, and placement of rural areas within economic system, the spatial aspects of rural areas, as well as sociological and cultural aspects of rural development.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, projektne delavnice,	Lectures, seminars, project workshops.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Projekt z javno predstavitvijo,	50,00 %	Project with public presentation,
ustni izpit	50,00 %	oral examination

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Prof. Dr. Andrej Udovč,

NIKOLOSKI, Trajče, **UDOVČ, Andrej**, PAVLOVIČ, Martin, RAJKOVIČ, Uroš. Farm reorientation assessment model based on multi-criteria decision making. *Computers and electronics in agriculture*. [Print ed.]. 2017, vol. 140, str. 237-243, ilustr. ISSN 0168-1699. http://www.sciencedirect.com/science/article/pii/S016816991630953X, DOI: 10.1016/j.compag.2017.06.011. [COBISS.SI-ID 7944723],

POTOČNIK SLAVIČ, Irma, CIGALE, Dejan, LAMPIČ, Barbara, PERPAR, Anton (avtor, fotograf), **UDOVČ, Andrej**, CIGALE, Dejan (urednik), POTOČNIK SLAVIČ, Irma (urednik, fotograf). *(Ne)raba razpoložljivih virov na kmetijah v Sloveniji*. 1. izd. Ljubljana: Znanstvena založba Filozofske fakultete, 2016. 166 str., ilustr. GeograFF, 19. ISBN 978-961-237-854-7. [COBISS.SI-ID 286317312]

BRNKALAKOVÁ, Stanislava, MELNYKOVYCH, Mariana, NIJNIK, Maria, BARLAGNE, Carla, PAVELKA, Marián, **UDOVČ, Andrej**, MAREK, Michal V., KOVAC, Urban, KLUVÁNKOVÁ, Tatiana. Collective forestry regimes to enhance transition to climate smart forestry. *Environmental policy and governance*. 2022, vol. 32, iss. 6, str. 492-503. ISSN 1756-932X. DOI: 10.1002/eet.2021. [COBISS.SI-ID 121948163]

RUDOLF, Janja, **UDOVČ, Andrej.** Introducing the SWOT scorecard technique to analyse diversified ae collective schemes with a DEX model. *Sustainability*. 2022, vol. 14, no. 2 (785), str. 1-19. ISSN 2071-1050. https://www.mdpi.com/2071-1050/14/2/785, DOI: 10.3390/su14020785. [COBISS.SI-ID 93295875]

ŠUMRADA, Tanja, VREŠ, Branko, ČELIK, Tatjana, ŠILC, Urban, RAC, Ilona, **UDOVČ, Andrej**, ERJAVEC, Emil. Are result-based schemes a superior approach to the conservation of High Nature Value grasslands? : evidence from Slovenia. *Land Use Policy*. [Online ed.]. 2021, art. 105749, vol. 111, str. 1-14, ilustr. ISSN 1873-5754. https://www.sciencedirect.com/science/article/pii/S0264837721004725, DOI: 10.1016/j.landusepol.2021.105749. [COBISS.SI-ID 82532099]

UDOVČ, Andrej, BONČA, Sandra. Sustainable transport in the fruit and vegetable supply chain. V: DOMAGAŁA, Joanna (ur.), GÓRECKA, Aleksandra (ur.), ROMAN, Monika (ur.). *Sustainable logistics : how to*

address and overcome the major issues and challenges. Abingdon, Oxon; New York, NY: Routledge, 2023. Str. 179-200. ISBN 978-1-032-30297-3, ISBN 978-1-003-30436-4. [COBISS.SI-ID 136190211]

Prof. Dr. Majda Černič Istenič

LIOUTAS, Evagelos D., CHARATSARI, Chrysanthi, DE ROSA, Marcello, LA ROCCA, Giuseppe, **ČERNIČ ISTENIČ, Majda**. Co-resourcing and actors' practices as catalysts for agricultural innovation. *The journal of agricultural education and extension*. 2022, vol. 28, no. 2, str. 209-229. ISSN 1389-224X. DOI: 10.1080/1389224X.2021.1953547. [COBISS.SI-ID 70173955]

BARTOL, Tomaž, **ČERNIČ ISTENIČ, Majda**, STOPAR, Karmen, HOČEVAR, Marjan. Rural areas, rural population, and rural space in central Europe (JCEA countries) : Research visualization in Scopus and Web of Science. Journal of Central European Agriculture : JCEA. [Online ed.]. 2022, vol. 23, no. 1, str. 246-260. ISSN 1332-9049, DOI: 10.5513/JCEA01/23.1.3428. [COBISS.SI-ID 101189635]

ČERNIČ ISTENIČ, Majda. Perception of the safety of a place by the urban and rural population in Slovenia. Revija za kriminalistiko in kriminologijo. okt.-dec. 2021, letn. 72, št. 4, str. 297-308, ilustr. ISSN 0034-690X. [COBISS.SI-ID 95684099]

LIOUTAS, Evagelos D., CHARATSARI, Chrysanthi, **ČERNIČ ISTENIČ, Majda**, LA ROCCA, Giuseppe, DE ROSA, Marcello. The challenges of setting up the evaluation of extension systems by using a systems approach: the case of Greece, Italy and Slovenia. *The journal of agricultural education and extension*. 2019, vol. 25, no. 2, str. 139-160. ISSN 1389-224X. DOI: 10.1080/1389224X.2019.1583818. [COBISS.SI-ID 9178745],

CVEJIĆ, Rozalija, **ČERNIČ ISTENIČ, Majda**, GLAVAN, Matjaž, HONZAK, Luka, KLANČNIK, Katja, KOMPARE, Karin, PINTAR, Marina. Increasing climate change resilience in agriculture: who is responsible?. *Water science and technology: water supply*. 2019, vol. 19, iss. 5, str. 1405-1412. ISSN 1606-9749. DOI: 10.2166/ws.2019.009. [COBISS.SI-ID 9152633],

ČERNIČ ISTENIČ, Majda, KNEŽEVIĆ HOČEVAR, Duška. The organisation of care for older people in rural communities : two case studies from Slovenia. Sociální studia. 2018, vol. 15, no. 1, str. 65-81. ISSN 1214-813X. DOI: 10.5817/SOC2018-1-65 [COBISS.SI-ID 9107321]

EKSPERIMENTALNA EVOLUCIJA MIKROORGANIZMOV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Eksperimentalna evolucija mikroorganizmov
Course title:	Experimental evolution of microorganisms
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0643143

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
0	2	0	0	23	100	5

Nosilec predmeta/Lecturer:	Anna Dragoš
Izvajalci predavanj:	
Izvajalci seminarjev:	Anna Dragoš
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	individualno raziskovalni /individual research course
Jeziki/Languages:	Predavanja/Lectures: Angleščina, Slovenščina Vaje/Tutorial: Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General prerequisites for doctoral study

Vsebina:	Content (Syllabus outline):
Eksperimentalna evolucija omogoča preučevanje evolucijskih sprememb znotraj eksperimentalnih populacij, ki nastanejo kot posledica selekcijskega pritisk, ki ga naloži raziskovalec. Že desetletja nam eksperimentalna evolucija omogoča manipuliranje z mikrobi in raziskovanje dolgoročne dinamike v	Experimental evolution allows to study evolutionary changes within experimental populations, that occur as a consequence of selection regime imposed by the experimenter. Since decades, experimental evolution has allowed us to manipulate microbes and to explore the long-

mikrobnih populacijah. Metodo so uporabljali pri različnih modelnih mikroorganizmih, kot so kvasovke, glive, bakterije ali fagi. Omogoča preverjanje hipotez vezanih na temeljna biološka vprašanja: kako se razvija večceličnost? Kako se mikrobi prilagajajo abiotskemu ali biotskemu stresu, življenju v biofilmih ali nestabilnemu okolju? Kako se paraziti prilagajajo novemu gostitelju in obratno? V okviru predmeta se bo doktorski študent naučil osnovnih principov eksperimentalne evolucije mikrobov v teoriji in praksi. V teoretičnem delu se bo študent seznanil z temeljno literaturo ter dodatno izbrano znanstveno publicistiko, ki je lahko vezana na doktorsko temo. Kandidat se bo lahko pridružil tedenskim srečanjem katedre »Journal Club«, kjer bo predstavil eno izbrano publikacijo. Ta bo služila kot izhodna točka za praktični del predmeta. V praktičnem delu bo študent oblikoval evolucijski eksperiment, ki bo obravnaval raziskovalno vprašanje po lastni izbiri, lahko tudi vezano na tematiko doktorske disertacije. Končno temo bo izbral v dogovoru z nosilko predmeta in po potrebi tudi po dogovoru z mentorjem študenta. Med posvetovanjem bo predavatelj podal povratne informacije o eksperimentalnim načrtu: tip selekcijskega pritiska, število populacij, število prenosov in pogostost vzorčenja/arhiviranja ter fenotipske analize za primerjavo razvitih populacij/izolatov s prednikom. Študent izvaja eksperiment sam, možna pa so dodatna posvetovanja med in po eksperimentalnem delu, kjer predavatelj poda povratno informacijo o rezultatih. Eksperiment se lahko izvaja v laboratoriju mentorja in po potrebi in dogovoru tudi v laboratoriju nosilke predmeta. Ob koncu predmeta študent odda kratko pisno poročilo in predstavi rezultate na raziskovalnem seminarju. *predmet ne zajema genomske analize evolviranih izolatov in mehanizmov molekularne evolucije	term dynamics in microbial populations. It was used in variety of model microorganisms such as yeasts, fungi, bacteria or phages. It allows to test hypotheses linked to fundamental biological questions: how does multicellularity evolve? How microbes adapt to abiotic or biotic stress, biofilm lifestyle, or changing environment? How parasites adapt to new host and vice versa? During the course, a PhD student will learn basic principles of microbial experimental evolution in theory and practice. In the theoretical part, the student will familiarize him/herself with recommended readings, and additional selected publication possibly connected to the students PhD topic. The candidate may participate in weekly meeting within the Chair »Journal Club« where he/she can present the selected publication. It will serve as a starting point for the practical part of the course. During the practical part the student will design an evolution experiment to address research question of his/her choice, which could be also relevant for their PhD thesis. Final topic will be selected in agreement with the lecturer, and if needed, also in agreement with the PhD supervisor. During the consultation the lecturer will provide feedback on experimental design: type of selection regime, nr of populations, nr of transfers and sampling/archiving frequency, and phenotypic assays to compare the evolved populations/isolates with the ancestor. The student conducts the experiment alone, but additional consultations are possible during and after the experimental part, where lecturer provides feedback on the results. The experiment can be conducted in the laboratory of the supervisor or if needed, and after mutual agreement, in the laboratory of the lecturer. At the end of the course, the student hands in a short, written report, and presents the data on research seminar. *the course does not cover genomic analysis of the evolved isolates and mechanisms of molecular evolution

Temeljna literatura in viri/Readings:

Kawecki et al., 2012, Trends in Ecology & Evolution doi: 10.1016/j.tree2012.06.001

Dragoš & Kovács, 2019, Journal of Molecular Biology doi: 10.1016/j.jmb.2019.02.005

Dodatna literatura izbrana v povezavi z izbranim eksperimentom / Additional literature will be selected in connection to eksperimental design

Cilji in kompetence:	**Objectives and competences:**
Doktorski študent spozna možne aplikacije eksperimentalne evolucije in lahko postavi lasten eksperiment vezan na doktorsko nalogo. Študent se nauči načrtovati in izvesti eksperiment ter kritično analizirati podatke.	PhD candidate learns about possible applications of experimental evolution and he/she can set-up an evolution experiment (favorably in connection to PhD thesis). PhD candidate learns how to design and conduct the experiment and how to critically analyze the data.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Razumevanje osnovnih načel eksperimentalne evolucije. Sposobnost uporabe exp. evolucije kot metode za testiranje določenih raziskovalnih vprašanj/hipotez.	Understanding basic principles of experimental evolution. Ability to use exp. evolution as a tool to test specific research questions/hypotheses.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Analiza raziskovalnega članka po izboru študenta in nosilke predmeta, javno nastopanje v okviru raziskovalnih srečan, ki jih organizira nosilka predmeta. Eksperimentalni načrt (pripravi študent), komentarje (nosilka predmeta), prilagojen načrt (študent). Evolucijski eksperiment in analiza rezultatov (študent) in diskusija z nosilko predmeta.	Analysis of research manuscript selected by the student and lecturer, public presentation during research meetings organized by the lecturer. Experimental design (student) and feedback (lecturer), adjusted experimental plan (student). Evolution experiment and results interpretation (student) and discussion with lecturer.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Uvodni seminar	10,00 %	Presentation clarity assessed by lecturer.
Praktični del	60,00 %	Involvment in practical work assessed by lecturer.
Poročilo in končna predstavitev	30,00 %	Report and final presentation assessed by lecturer.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Anna Dragoš

1. Gallegos-Monterrosa R, Nordgaard Christensen M, Barchewitz T, Koppenhöfer S, Priyadarshini B, Bálint B, Maróti G, Kempen PJ, Dragoš A, Kovács ÁT. 2021. Impact of Rap-Phr system abundance on adaptation of *Bacillus subtilis*. Communications biology 13;4(1):468 doi: 10.1038/s42003-021-01983-9

2. Dragoš A., Priyadarshini B., Hasan Z., Lenz-Strube M., Kempen PJ., Maróti G., Kaspar C., Bose B., Burton BM., Bischofs IB., Kovács AT. 2020. Pervasive prophage recombination occurs during evolution of spore-forming Bacilli. ISME J, doi: 10.1038/s41396-020-00854-1

3. Martin M, Dragoš A, Otto SB, Schäfer D, Brix S, Maróti G, Kovács ÁT. 2020. Cheaters shape the evolution of phenotypic heterogeneity in *Bacillus subtilis* biofilms. The ISME journal 14 (9), 2302-2312

4. Dragoš A., Kovács ÁT. 2019. Evolved biofilm: review on the experimental evolution studies of *Bacillus subtilis* pellicles. Journal of Molecular Biology, doi: 10.1016/j.jmb.2019.02.005

5. Dragoš A., Martin M., Falcón García C.,Kricks L., Pausch P., Heimerl T., Bálint B., Maróti G., Bange G., López D., Lieleg O., Kovács ÁT. 2018. Collapse of genetic division of labor and evolution of autonomy in pellicle biofilms. Nature Microbiology 3: 1451–1460

6. Dragoš A., Lakshmanan N., Martin M., Bálint B., Maróti G., Falcon Garcia C., Lieleg O., Kovács ÁT. 2018. Evolution of exploitative interactions during diversification in *Bacillus subtilis* biofilms. FEMS Microbiology Ecology, doi.org/10.1093/femsec/fix155

7. Martin M.*, Dragoš A.*, Hölscher T.*, Maróti G., Bálint B., Westermann M., Kovács ÁT. 2017. De novo evolved interference competition promotes the spread of biofilm defectors. Nature Communications, doi: 10.1038/ncomms15127

ELEKTROFIZIOLOŠKE MERITVE NANOMETRSKIH RAZSEŽNOSTI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Elektrofiziološke meritve nanometrskih razsežnosti
Course title:	Electrophysiology in nanometer scale
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037355
Koda učne enote na članici/UL Member course code:	3858

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
	15	10	0	0	100	5

Nosilec predmeta/Lecturer:	Robert Zorec

Izvajalci predavanj:	
Izvajalci seminarjev:	Helena Chowdhury, Marko Kreft, Robert Zorec
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	individualno raziskovalni/individual research

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Diploma naravoslovne smeri, opravljeni izpiti Temeljna fiziologija, Celična fiziologija, Funkcionalna biologija celice, Molekulska fiziologija	Undergraduate degree in sciences, with exams of Fundamental Physiology, Cell Physiology, Functional biology of the cell, Molecular Physiology

Vsebina:	**Content (Syllabus outline):**
Snov je razdeljena na več delov (npr. nekaj iztočnic iz zgodovine elektrofiziologije, analogno vezje membrane, ponazoritev mirovnega membranskega potenciala, ponazoritev meritve potenciala motorične ploščice in akcijskega potenciala, meritve tokov prek membrane, metoda vpete napetosti [voltage-clamp]),	The course is divided into several sections: Backgroung and history of bioelectrical phenomena, analog electrical circuit of cell membrane, mechanisms and demonstration of resting membrane potential, mechanisms and demonstrations of postsynaptic potentials, action potentials, single

meritve membranske kapacitivnosti, kombinacija optičnih metod za študij homeostaze citosolnega kalcija skupaj z elektrofiziološkimi metodami, uporaba metod molekularne biologije in elektrofiziologije skupaj z metodami za slikanje subcelularnih struktur. Študent uporabi pridobljeno znanje pri svojem delu tako, da reši naloge, ki so povezane z lastnim raziskovalnim problemom in izlušči iz literature znanstveni problem, ki ga skuša rešiti z metodami, ki jih obravnava ta predmet. Pri predmetu sodelujejo zn. sod. dr. Jernej Jorgačevski, zn. sod. dr. Matjaž Stenovec in drugi vabljeni predavatelji.	channel recording techniques, the voltage-clamp techniques, measurements of membrane capacitance, combining electrophysiological techniques with optical techniques, measurements of cytosolic calcium activity, combined use of electrophysiology and molecular biology techniques to sample cytosol and manipulate gene expression in single cells, combining quantitative imaging techniques to study subcellular structures. Students will use the learned knowledge by using these techniques in their own research. Moreover, by studying the literature they will be able to identify physiological problems that can be addressed with the learned approaches. Dr. Jernej Jorgačevski, Dr. Mataž Stenovec and other invited lecturers will cooperate at the course.

Temeljna literatura in viri/Readings:

Katz B: Nerve. muscle, synapse. McGraw-Hill, 1966
Aidley DJ: The physiology of excitable cells. Cambridge Univ. Press, 1991.
Hille B (1992). Ionic channels of excitable membranes. Sinauer Associates.;
Sperelakis N (2012) Cell Physiology. Academic Press.
Zorec, R (1988). Ionski kanalčki v celični membrani. Kaj lahko raziskujemo z metodo "patch clamp"?. Med. razgl., 27, št.1 (1988), str.37-53.
Sakmann B in Neher E (1995) Single Channel Recording 2nd ed. Plenum Press, New York

Cilji in kompetence:	**Objectives and competences:**
Elektrofiziologija je veja fiziologije, ki se je uveljavila tako v rutinskem, kliničnem raziskovalnem (elektroencefalografija, elektrokardiografija, elektromiogragija) kot v temeljnem raziskovalnem delu. V slednjem se sicer še vedno ponekod uporablja v obliki ekstracelularne, bipolarne ali unipolarne registracije, večinoma pa vse bolj kot mikroelektrofiziologija in nanoelektrofiziologija, s katero lahko študiramo lastnosti posamezne molekule ali osamljenih delov membrane ali celičnih predelkov. Tu uporabljamo različne steklene mikroelektrode, npr. za registracijo intracelularnih sinaptičnih potencialov, sinaptičnega toka (metoda *voltage-clamp*), aktivacija in lastnosti posameznih membranskih kanalčkov (metoda *patch-clamp*) ter meritve ekso- in endocitoze hormonsko aktivnih in drugih celic z merjenjem lastnosti fuzijske pore, ki imajo premer manjši od nanometra (metoda *patch-clamp* v različici *whole-cell recording, cell-attached recording, inside-out in outside out recording)*. Cilj predmeta je pridobitev temeljnih znanj za pristop k raziskavam membranskih procesov evkariontskih celic in njenih podcelličnih predelkov. Slušatelj bo pridobil temeljne kompetence za uporabo elekrofizioloških metod pri raziskovalnem delu na posamezni celici; ki s svojim delovanjem prispevajo k delovanju tkih in višjih organizacijskih enot.	Electrophysiology represents a subdivision of Physiology, which has been used in routine clinical work and clinical research (recording EEG, ECG, EMG) as well as in fundamental research. In the latter area electrophysiological techniques are used for extracellular, bipolar or unipolar signal registration, but in recent years mostly as nano and microelectrophysiological recordings for the study of single molecules or isolated membrane patches or even isolated subcellular structures. For these approaches different glass micropipettes are used. For example, for the registration of synaptic potentials with intracellular recording techniques very sharp glass microelectrodes are used. For measuring synaptic currents the *voltage-clamp* method is used. Properties of single ion channels is studied with fire-polished glass pipettes with relatively wide tips under the voltage-clamp conditions (The *patch-clamp method*). Similarly, measuremnts of exo- and endocytosis in secretory cells and the properties of the fusion pore, with diamenter at the subnanometer scale, the method of patch clamping is used (either in the *whole-cell recording, cell-attached recording, inside-out and outside-out recording configurations)*. The aim of the course is to offer the candidates the key knowledge required to conduct the physiological research of membrane processes at the level of single cells as well as the subcellular membrane bound organelles. Thus the candidates will gain key competences and expertise to conduct their own research in this field.

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: Študent se nauči osnov sledečih metod: Metoda vpete napetosti, metode vpete napetosti krpice membrane (angl. The patch-clamp technique) za meritve tokov in napetostnih sprememb prek membarne cele celice, za meritve tokov skozi posamezni kanal, makroskopske in mirksoskopske meritve membranske kapacitete, ki zrcalijo celične proceses ekso- in endocitoze. Kombinirane elektrofiziološke in optofiziološke metode (metode za fotolizo vklenjenih sekundarnih prenašalcev) z metodami za fluorescenčno označevanje subceličnih predelkov.	Knowledge and understanding: Students will gain fundamental knowledge of the: The voltage-clamp method of whole cells. The voltage-clamp method of an isolated membrane patch, i.e. the patch-clamp technique. Both are used for the measurements of currents and voltages across the membrane of whole cells and for measurements of currents through single ion channels. The latter methods are ideal also for measurements of macroscopic and microscopic changes in membrane capacitance, a parameter that is linear to the membrane area. Membrane area fluctuations reflect the processes of exo- ad endocytosis. Together with electrophysiological techniques, the candidates will learn about combining these methods with optophysiological techniques (measurements of cytosolic calcium and other second messengers) with fluorescent methods to label subcellular structures.

Metode poučevanja in učenja:	Learning and teaching methods:
Kandidati bodo študirali teme, o katerih bodo opravljene predstavitve učitelj-učenec, oziroma bodo obravnavane v obliki konzultacij; pripraviti bodo morali več seminarskih nalog in praktično delo v laboratoriju.	Students will focus into the study through tutor-student consultations; work in the lab with cells and equipment, through essay work and through their own research and learning about data analysis.

Načini ocenjevanja:	Delež/Weight	Assessment:
Študent opravi izpit, ki sestoji iz pisne esejske izpitne naloge.	100,00 %	Students are evaluated on the basis of their essay assignments.

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

akad. prof. dr. Robert Zorec

KABASO, Doron, JORGAČEVSKI, Jernej, COSTA CALEJO, Ana-Isabel, FLAŠKER, Ajda, GUČEK, Alenka, KREFT, Marko, ZOREC, Robert. Comparison of unitary exocytic events in pituitary lactotrophs and in astrocytes : modeling the discrete open fusion-pore states. Frontiers in cellular neuroscience, ISSN 1662-5102, Apr. 2013, vol. 7.
COSTA CALEJO, Ana-Isabel, JORGAČEVSKI, Jernej, SILVA, V.S., STENOVEC, Matjaž, KREFT, Marko, GONÇALVES, Paula P., ZOREC, Robert. Aluminium-induced changes of fusion pore properties attenuate prolactin secretion in rat pituitary lactotrophs. Neuroscience, ISSN 0306-4522. [Print ed.], 2012, vol. 201, str. 57-66, ilustr., doi:10.1016/j.neuroscience.2011.11.015.
KABASO, Doron, GONGADZE, Ekaterina, JORGAČEVSKI, Jernej, KREFT, Marko, VAN RIENEN, Ursula, ZOREC, Robert, IGLIČ, Aleš. Exploring the binding dynamics of bar proteins. Cellular & molecular biology letters, ISSN 1425-8153, 2011, vol. 16, no. 3, str. 398-411 in S1-S8, ilustr.
THIEL, Gerhard, KREFT, Marko, ZOREC, Robert. Rhythmic kinetics of single fusion and fission in a plant cell protoplast. Annals of the New York Academy of Sciences, ISSN 0077-8923, 2009, letn. 1152, str. 1-6, doi: 10.1111/j.1749-6632.2008.03996.x.
DARIOS, Frédéric, WASSER, Catherine, SHAKIRZYANOVA, Anastasia, GINIATULLIN, Artur, JORGAČEVSKI, Jernej, KREFT, Marko, ZOREC, Robert, et al. Sphingosine facilitates SNARE complex

assembly and activates synaptic vesicle exocytosis. Neuron, ISSN 0896-6273, 2009, letn. 62, str. 683-694, doi: 10.1016/j.neuron.2009.04.024.
VARDJAN, Nina, STENOVEC, Matjaž, JORGAČEVSKI, Jernej, KREFT, Marko, GRILC, Sonja, ZOREC, Robert. The fusion pore and vesicle cargo discharge modulation. Annals of the New York Academy of Sciences, ISSN 0077-8923, 2009, letn. 1152, str. 135-144, doi: 10.1111/j.1749-6632.2008.04007.x.

prof. dr. Marko Kreft
COSTA CALEJO, Ana-Isabel, JORGAČEVSKI, Jernej, KUCKA, Marek, KREFT, Marko, GONÇALVES, Paula P., STOJILKOVIĆ, Stanko, ZOREC, Robert. cAMP-mediated stabilization of fusion pores in cultured rat pituitary lactotrophs. The Journal of neuroscience, ISSN 0270-6474, May 2013, vol. 33, iss. 18, str. 8068-8078, ilustr., doi:10.1523/JNEUROSCI.5351-12.2013.
RITUPER, Boštjan, GUČEK, Alenka, JORGAČEVSKI, Jernej, FLAŠKER, Ajda, KREFT, Marko, ZOREC, Robert. High-resolution membrane capacitance measurements for the study of exocytosis and endocytosis. Nature protocols, ISSN 1754-2189, 2013, vol. 8, no. 6, str. 1169-1183, ilustr., doi: 10.1038/nprot.2013.069.
JORGAČEVSKI, Jernej, KREFT, Marko, VARDJAN, Nina, ZOREC, Robert. Fusion pore regulation in peptidergic vesicles. Cell calcium, ISSN 0143-4160, 2012, vol. 52, iss. 3/4, str. 270-276, doi: 10.1016/j.ceca.2012.04.008.
TRKOV, Saša, STENOVEC, Matjaž, KREFT, Marko, POTOKAR, Maja, PARPURA, Vladimir, DAVLETOV, Bazbek, ZOREC, Robert. Fingolimod-A sphingosine-like molecule inhibits vesicle mobility and secretionin astrocytes. Glia, ISSN 0894-1491, 2012, vol. 60, no. 9, str. 1406-1416, doi: 10.1002/glia.22361.
KABASO, Doron, COSTA CALEJO, Ana-Isabel, JORGAČEVSKI, Jernej, KREFT, Marko, ZOREC, Robert, IGLIČ, Aleš. Fusion pore diameter regulation by cations modulating local membrane anisotropy. TheScientificWorldjournal, ISSN 1537-744X, 2012, vol. 2012, str. [1-7], ID 983138. http://www.tswj.com/2012/983138, doi: 10.1100/2012/983138
VARDJAN, Nina, STENOVEC, Matjaž, JORGAČEVSKI, Jernej, KREFT, Marko, ZOREC, Robert. Fusion pore: an evolutionary invention of nucleated cells. European review, ISSN 1062-7987, 2010, vol. 18, no. 3, str. 347-364, ilustr., doi: 10.1017/S1062798710000074.

Doc. dr. Helena Chowdhury
RITUPER, Boštjan, CHOWDHURY HAQUE, Helena, JORGAČEVSKI, Jernej, COORSSEN, Jens R., KREFT, Marko, ZOREC, Robert. Cholesterol-mediated membrane surface area dynamics in neuroendocrine cells. Biochimica et biophysica acta. Molecular and cell biology of lipids, ISSN 1388-1981, Jul. 2013, vol. 1831, iss. 7, str. 1228-1238
POTOKAR, Maja, LACOVICH, Valentina, CHOWDHURY HAQUE, Helena, KREFT, Marko, ZOREC, Robert. Rab4 and Rab5 GTPase are required for directional mobility of endocytic vesicles in astrocytes. Glia, ISSN 0894-1491, 2012, vol. 60, issue 4, str. 594-604, ilustr., doi: 10.1002/glia.22293.
PREBIL, Mateja, CHOWDHURY HAQUE, Helena, ZOREC, Robert, KREFT, Marko. Changes in cytosolic glucose level in ATP stimulated live astrocytes. Biochemical and biophysical research communications, ISSN 0006-291X, 2011, vol. 405, issue. 2, str. 308-313, doi: 10.1016/j.bbrc.2011.01.035.
KOVAČIČ, Petra Brina, CHOWDHURY HAQUE, Helena, VELEBIT MARKOVIĆ, Jelena, KREFT, Marko, JENSEN, Jørgen, ZOREC, Robert. New insights into cytosolic glucose levels during differentiation of 3T3-L1 fibroblasts into adipocytes. The Journal of biological chemistry, ISSN 0021-9258, 2011, vol. 286, no. 15, str. 13370-13381, ilustr., doi:10.1074/jbc.M110.200980.
VELEBIT MARKOVIĆ, Jelena, CHOWDHURY HAQUE, Helena, KREFT, Marko, ZOREC, Robert. Rosiglitazone balances insulin-induced exo- and endocytosis in single 3T3-L1 adipocytes. Molecular and cellular endocrinology, ISSN 0303-7207. [Print ed.], 2011, vol. 333, issue 1, str. 70-77, doi: 10.1016/j.mce.2010.12.014.
KREFT, Marko, PREBIL, Mateja, CHOWDHURY HAQUE, Helena, GRILC, Sonja, JENSEN, Jørgen, ZOREC, Robert. Analysis of confocal images using variable-width line profiles. Protoplasma, ISSN 0033-183X, 2010, letn. 246, št. 1/4, str. 73-80, doi: 10.1007/s00709-010-0127-7.

ELEKTROSTATIKA POVRŠIN IN NANOSTRUKTUR

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Elektrostatika površin in nanostruktur
Course title:	Electrostatics of surfaces and nanostructures
Članica nosilka/UL Member:	UL FE

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0566691
Koda učne enote na članici/UL Member course code:	0

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	0	95	5

Nosilec predmeta/Lecturer:	Aleš Iglič

Izvajalci predavanj:	Aleš Iglič, Veronika Kralj Iglič
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični /theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies

Vsebina:	Content (Syllabus outline):
Teoretični opis naelektrene površine v stiku z elektrolitsko raztopino (teorija električne dvojne plasti), dielektrične lastnosti električne dvojne plasti, elektrostatika nanostruktur, vpliv nanodelcev na interakcije med naelektrenimi površinami, adsorpcija naelektrenih nanodelcev na naelektrene površine, interakcija naelektrenih nanodelcev z naelektrenimi nanostrukturiranimi kovinskimi in polprevodniškimi površinami	Theoretical description of electrolyte solution in contact with charged surface (electric double layer theory), dielectric properties of electric double layer, electrostatics of nanostructures, adsorption of charged nanoparticles on charged surfaces, influence of charged nanoparticles on mediated interactions between charged surfaces, interaction of charged

	nanoparticles with nanostructured metallic and/or semiconductor surfaces

Temeljna literatura in viri/Readings:

1.A. Iglič, V. Kralj-Iglič, D. Drobne: Nanostructures in Biological Systems : theory and applications. Singapore: Pan Stanford; Boca Raton: CRC Press, 2015. ISBN 978-981-4303-43-9. https://doi.org/10.1201/b18607. [COBISS.SI-ID 11076436]
https://physics.fe.uni-lj.si/publications/publications.html
2.Israelachvili J. Intermolecular and Surface Forces, Academic Press, London, zadnja izdaja.
https://www.sciencedirect.com/book/9780123751829/intermolecular-and-surface-forces
3.Safran S.A. Statistical Thermodynamics of Surfaces, Interfaces, and Membranes, Addison-Wesley, Reading, New York, zadnja izdaja.
https://www.taylorfrancis.com/books/mono/10.1201/9780429497131/statistical-thermodynamics-surfaces-interfaces-membranes-samuel-safran
4.Butt H.-J., Graf K., Kappl M., Physics and Chemistry of Interfaces, Wiley, Weinheim, zadnja izdaja.
https://onlinelibrary.wiley.com/doi/book/10.1002/3527602313
Aktualni znanstveni članki iz področja, ki jih sproti določijo izvajalci predmeta.

Cilji in kompetence:	**Objectives and competences:**
Poznavanje teoretičnih eksperimentalnih osnov elektrostatskih interakcij v sistemih naelektrenih površin in nanodelcev.	Students are familiarised with physical description of electrostatic interactions in the systems of charged surfaces and charged nanoparticles.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje za izvedbo raziskav elektrostatskih interakcij v različnih sistemih naelektrenih površin in nanodelcev.	Knowledge and understanding which will qualify the candidate for carrying out the research in the field of electrostatic interactions in the systems of charged surfaces and charged nanoparticles

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, konzultacije, projektno/seminarsko delo.	Lectures, consultations, project/seminar work

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar ali projekt.	100,00 %	Seminar or project.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Aleš Iglič :
N. Rawat, M. Benčina, E. Gongadze, I. Junkar, A. Iglič: **Fabrication of antibacterial TiO2 nanostructured surfaces using hydrothermal method**. ACS Omega, 7: 47070−47077, 2022.
E. Gongadze, L. Mesarec, S. Kralj, V. Kralj-Iglič, A. Iglič: **On the Role of Electrostatic Repulsion in Topological Defect-Driven Membrane Fission.** Membranes, 11(11): 812, 2021.
J. Raval, E. Gongadze, M. Benčina, I. Junkar, N. Rawat, L. Mesarec, V. Kralj-Iglič, W. Góźdź, A. Iglič: **Mechanical and electrical interaction of biological membranes with nanoparticles and nanostructured surfaces**. Membranes, 11: 533, 2021.
M. Drab, E. Gongadze, V. Kralj-Iglič, A. Iglič: **Electric double layer and orientational ordering of water dipoles in narrow channels**, Entropy 22(9): 1054, 2020.
A.V. Dubtsov, S.V. Pasechnik, D.V. Shmeliova, A.Sh. Saidgaziev, E. Gongadze, A. Iglič, S. Kralj: **Liquid Crystalline Droplets in Aqueous Environment: Electrostatic Effects,** Soft Matter, 14(47): 9619-9630, 2018.

J. Gimsa, P. Wysotzki, Š. Perutkova, T. Weihe, P. Elter, P.E. Marszalek, V. Kralj-Iglič, A. Iglič: **The spermidine-induced attraction of like-charged surfaces is correlated with the pH-dependent spermidine charge: force spectroscopy characterization,** Langmuir, 34: 2725-2733, 2018.
Gongadze E., Mesarec L., Kralj-Iglič V., Iglič A.: **Asymmetric finite size of ions and orientational ordering of water in electric double layer theory within lattice model**, Mini-Rev. Med. Chem., 18: 1559-1566, 2018.
A. Dubtsov, S.V. Pasechnik, D. V. Shmeliova, A. Iglič, S. Kralj: **Influence of polar dopant on internal configuration of azoxybenzene nematic-in-water droplets,** Liquid crystals, 45: 388-400, 2018.
S. Mohajernia, A. Mazare, E. Gongadze, V. Kralj-Iglič, A. Iglič, P. Schmuki: **Self-organized, free-standing TiO2 nanotube membranes: Effect of surface electrokinetic properties on flow-through membranes**, Electrochimica Acta, 245: 25-31, 2017.
E. Gongadze, V. Kralj-Iglič, A. Iglič: **Unequal size of ions in modified Wicke-Eigen model of electric double layer**, Gen. Phys. Biophys., 36: 229–234, 2017.

Veronika Kralj-Iglič :
E. Gongadze, L. Mesarec, S. Kralj, V. Kralj-Iglič, A. Iglič: **On the Role of Electrostatic Repulsion in Topological Defect-Driven Membrane Fission.** Membranes, 11(11): 812, 2021.
J. Raval, E. Gongadze, M. Benčina, I. Junkar, N. Rawat, L. Mesarec, V. Kralj-Iglič, W. Góźdź, A. Iglič: **Mechanical and electrical interaction of biological membranes with nanoparticles and nanostructured surfaces**. Membranes, 11: 533, 2021.
M. Drab, E. Gongadze, V. Kralj-Iglič, A. Iglič: **Electric double layer and orientational ordering of water dipoles in narrow channels**, Entropy 22(9): 1054, 2020.
M. Drab, V. Kralj-Iglič: **Electric double layer of electrons: Attraction between two like-charged surfaces induced by Fermi-Dirac statistics**, Phys. Lett. A 383, 358–365, 2019.
A. Iglič, E. Gongadze and V. Kralj-Iglič: **Differential capacitance of electric double layer – influence of asymmetric size of ions, thickness of Stern layer and orientational ordering of water dipoles**, Acta Chim. Slov. 66, 534–541, 2019.
Gongadze E., Mesarec L., Kralj-Iglič V., Iglič A.: **Asymmetric finite size of ions and orientational ordering of water in electric double layer theory within lattice model**, Mini-Rev. Med. Chem., 18: 1559-1566, 2018.
J. Gimsa, P. Wysotzki, Š. Perutkova, T. Weihe, P. Elter, P.E. Marszalek, V. Kralj-Iglič, A. Iglič: **The spermidine-induced attraction of like-charged surfaces is correlated with the pH-dependent spermidine charge: force spectroscopy characterization,** Langmuir, 34: 2725-2733, 2018.
S. Mohajernia, A. Mazare, E. Gongadze, V. Kralj-Iglič, A. Iglič, P. Schmuki: **Self-organized, free-standing TiO2 nanotube membranes: Effect of surface electrokinetic properties on flow-through membranes**, Electrochimica Acta, 245: 25-31, 2017.
E. Gongadze, V. Kralj-Iglič, A. Iglič: Unequal size of ions in modified Wicke-Eigen model of electric double layer, Gen. Phys. Biophys., 36: 229–234, 2017.

FIZIKALNO-BIOKEMIJSKE METODE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fizikalno-biokemijske metode
Course title:	Physical-biochemical methods
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037365
Koda učne enote na članici/UL Member course code:	3868

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	10	20	0	0	85	5

Nosilec predmeta/Lecturer:	Nataša Poklar Ulrih

Izvajalci predavanj:	Gregor Anderluh, Janez Plavec, Nataša Poklar Ulrih
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Študentje se bodo srečali z osnovami fizikalne-biokemije bioloških molekul, interakcijami med molekulami, vezanjem majhnih molekul (antibiotiki, aditivi, antioksidanti, kovinski ioni, etc. na makromolekule). Za proučevanje stabilnosti, interakcij in strukture molekul bodo študentje spoznali kalorimetrijo in spektroskopske tehnike, ki imajo široko uporabnost v živilstvu, farmaciji, biokemiji, medicini in drugih področjih. Površinska	Students will meet with the basics of physical-chemistry of biological molecules, interactions between molecules, binding of small molecules (antibiotics, additives, antioxidants, metal ions, etc..) to macromolecules. To study the stability, interactions and molecular structure, students will be introduced to differential scanning calorimetry and spectroscopic techniques, which have wide applicability in the food industry, pharmacy, biochemistry, medicine and other

plazmonska resonance (SPR) je tehnika, ki se je v zadnjih letih pokazala tudi kot zelo pomembno orodje v farmacevtski in prehrambeni industriji. Vključi se lahko v vse faze odkrivanja novih zdravil, izboljševanja njihovih lastnosti, saj je možno zelo enostavno in hitro pregledati večje število vezavnih partnerjev za potencialne terapevtske tarče. Tista, ki se močno vežejo na receptorje, lahko v naslednji stopnji analiziramo z drugimi metodami. SPR postaja pomembno orodje tudi v prehrambeni industriji, kjer ga lahko uporabimo za kontrolo kvalitete hrane. Iz kompleksne mešanice molekul lahko hitro in z veliko natančnostjo zasledimo vezavo že zelo majhnih količin iskane molekule. Opisane bodo tudi komplementarne metode za študij molekulskih interakcij kot so izotermalna mikrokalorimetrija in termoforeza. Študentje bodo spoznali tudi različne tipe biosenzorjev, tako tiste, ki za svojo detekcijo uporabljajo encime, imunološka protitelesa, celične strukture, kot tudi cele mikroorganizme. Pri tem se bodo študentje spoznali z osnovami različnih metod detekcije (elektrokemijske, optične, termične). Poseben poudarek bo na uporabi biosenzorjev za analize živil in za spremljanje biotehnoloških procesov. V zadnjem obdobju se tehnike kot sta elektronska spinska resonanca (EPR) in nuklearna magnetna resonanca (NMR) vedno več uporabljata tudi v živilstvu za proučevanje structure in interakcij med molekulami. Študentje bodo spoznali osnove teh tehnik in njihovo uporabnost. Študentom bo omogočeno tudi delo na teh inštrumentih in prenos znanja na nova področja aplikacij.	fields. Surface plasmon resonance (SPR) is a technique that has been shown in recent years as a very important tool in the pharmaceutical and food industry. It can be included in all phases of drug discovery, improve their properties, it is possible to very easily and quickly scan a large number of binding partners for potential therapeutic target. SPR is becoming an important tool in the food industry, which can be used for quality control. Complementary methods for studying molecular interactions, such as isothermal microcalorimetry and thermophoresis, will also be presented. Students will learn about the different types of biosensors. The ones, which for their detection are using enzyme-antibody immunological, cell structure, as well as whole organisms. The students will learn the basics of different detection methods (electrochemical, optical, and thermal). Special emphasis will be on the use of biosensors for food analysis and monitoring of biotechnological processes. Lately, techniques such as electron spin resonance (EPR) and nuclear magnetic resonance (NMR) and used in the food industry to study the structure and interactions between molecules. The emphasis of the subject is on the techniques and their applications in food science and industry. Students will work on these instruments and expand the application of these techniques into new areas of food science and technology.

Temeljna literatura in viri/Readings:

- Aktualni znanstveni in pregledni članki, ki so javno dostopni preko spleta

Cilji in kompetence:	**Objectives and competences:**
Študentje se seznanijo s fizikalnimi zakonitostmi, ki določajo lastnosti bioloških makromolekul v živilih. Spoznavanje fizikalno-kemijskih metod (inštrumentalnih metod), ki se v zadnjem času vedno bolj uporabljajo za proučevanje živil. Študentje se bodo v laboratoriju srečali s praktično uporabo nekaterih od naštetih inštrumentalnih tehnik v živilstvu, in biotehnologiji.	Students will learn about the physical laws that determine the properties of biological macromolecules in food. Understanding the physical-chemical methods (instrumental methods) that have recently been increasingly used for the study of food. Students will meet in the lab to practical application of some of these instrumental techniques in the food industry, and biotechnology.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Predmet daje znanje, potrebno pri razvoju novih metod v raziskovalnem delu v živilski in prehrambni stroki.	Knowledge and understanding: The course provides the knowledge necessary to develop new methods in research work in the food science and technology.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijsko delo, samostojna priprava seminarjev in predstavitev.	Lectures, seminars, project workshops, laboratory work.

Načini ocenjevanja:	Delež/Weight	Assessment:
Seminar s predstavitvijo	50,00 %	Project with public presentation
Pisno preverjanje znanja	50,00 %	written exam

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Nataša Poklar Ulrih

DOS SANTOS FERREIRA, Cristina, PEREYRA GONZALES, Adriana, MAZZOBRE, M. Florenzia, POKLAR ULRIH, Nataša, PILAR BUERA, María del. Solubility, sorption isotherms and thermodynamic parameters of [beta]-cyclodextrin complexes with poplar propolis components: practical implicances. *Lebensmittel-Wissenschaft + Technologie*. 2022, vol. 167, str. 1-8, art. 113811. ISSN 0023-6438. DOI: 10.1016/j.lwt.2022.113811. [COBISS.SI-ID 119094275].

RAKIĆ, Violeta, RINNAN, Åsmund, POLAK, Tomaž, SKRT, Mihaela, MILJKOVIĆ, Milena, POKLAR ULRIH, Nataša. pH-induced structural forms of cyanidin and cyanidin 3-O-[beta]-glucopyranoside. *Dyes and pigments*. [Print ed.]. 2019, vol. 165, str. 71-80, ilustr. ISSN 0143-7208. DOI: 10.1016/j.dyepig.2019.02.012. [COBISS.SI-ID 5026168]

ŠTURM, Luka, OSOJNIK ČRNIVEC, Ilja Gasan, ISTENIČ, Katja, OTA, Ajda, MEGUŠAR, Polona, SLUKAN, Anže, HUMAR, Miha, LEVIĆ, Steva, NEDOVIĆ, Viktor, KOPINČ, Rok, DEŽELAK, Matjaž, PEREYRA GONZALES, Adriana, POKLAR ULRIH, Nataša. Encapsulation of non-dewaxed propolis by freeze-drying and spray-drying using gum Arabic, maltodextrin and inulin as coating materials. *Food and bioproducts processing*. Jul. 2019, vol. 116, str. 196-211, ilustr. ISSN 0960-3085. DOI: 10.1016/j.fbp.2019.05.008. [COBISS.SI-ID 5059960]

ŠTURM, Luka, OSOJNIK ČRNIVEC, Ilja Gasan, PRISLAN, Iztok, POKLAR ULRIH, Nataša. Comparing the effects of encapsulated and non-encapsulated propolis extracts on model lipid membranes and lactic bacteria, with emphasis on the synergistic effects of its various compounds. *Molecules*. 2023, vol. 28, iss. 2, str. 1-21, ilustr. ISSN 1420-3049. https://www.mdpi.com/1420-3049/28/2/712, DOI: 10.3390/molecules28020712. [COBISS.SI-ID 137197827]

PRISLAN, Iztok, URBIČ, Tomaž, POKLAR ULRIH, Nataša. Thermally induced transitions of d(G4T4G3G4T4G3) quadruplexes can be described as kinetically driven processes. *Life*. Jun. 2022, vol. 12, iss. 6, str. 1-15, ilustr. ISSN 2075-1729. https://www.mdpi.com/2075-1729/12/6/825/htm, DOI: 10.3390/life12060825. [COBISS.SI-ID 110011395]

Janez Plavec

RUGGIERO, Emanuela, FRASSON, Ilaria, TOSONI, Elena, SCALABRIN, Matteo, PERRONE, Rosalba, PLAVEC, Janez, MARUŠIČ, Maja, RICHTER, Sara N. Fused in liposarcoma protein, a new player in the regulation of HIV-1 transcription, binds to known and newly identified LTR G-quadruplexes. ACS infectious diseases. 2022, vol. 8, iss. 5, str. 958-968. ISSN 2373-8227. https://pubs.acs.org/doi/pdf/10.1021/acsinfecdis.1c00508, DOI: 10.1021/acsinfecdis.1c00508. [COBISS.SI-ID 109586435]

GHOSH, Anirban, TRAJKOVSKI, Marko, TEULADE-FICHOU, Marie-Paule, GABELICA, Valerie, PLAVEC, Janez. Phen−DC3 induces refolding of human telomeric DNA into a chair-type antiparallel G-quadruplex through ligand intercalation. Angewandte Chemie : International edition. 2022, vol. 61, iss. 40, str. 1-8. ISSN 1521-3773. https://onlinelibrary.wiley.com/doi/epdf/10.1002/anie.202207384, DOI: 10.1002/anie.202207384. [COBISS.SI-ID 124017411]

LI, Qiang, TRAJKOVSKI, Marko, FAN, Chaochao, CHEN, Jialiang, ZHOU, Yifei, LU, Kuan, LI, Hongjun, SU, Xuncheng, XI, Zhen, PLAVEC, Janez, ZHOU, Chuanzheng. 4'-SCF3-labeling constitutes a sensitive 19F NMR probe for characterization of interactions in the minor groove of DNA. Angewandte Chemie: International edition 2022, vol. 61, iss. 47, str. [1-9]. ISSN 1521-3773. https://onlinelibrary.wiley.com/doi/10.1002/anie.202201848, DOI: 10.1002/anie.202201848. [COBISS.SI-ID 130487299]

TAKAHASHI, Shuntaro, KOTAR, Anita, TATEISHI-KARIMATA, Hisae, BHOWMIK, Sudipta, WANG, Zi-Fu, CHANG, Ta-Chau, SATO, Shinobu, TAKENAKA, Shigeori, PLAVEC, Janez, SUGIMOTO, Naoki.

Chemical modulation of DNA replication along G-quadruplex based on topology-dependent ligand binding. Journal of the American Chemical Society 2021, vol. 143, iss. 40, str. 16458-16469. ISSN 0002-7863. https://pubs.acs.org/doi/10.1021/jacs.1c05468, DOI: 10.1021/jacs.1c05468. [COBISS.SI-ID 82874883]
LENARČIČ ŽIVKOVIĆ, Martina, GAJARSKÝ, Martin, BEKOVÁ, Kateřina, STADLBAUER, Petr, VICHEREK, Lukáš, PETROVÁ, Magdaléna, FIALA, Radovan, ROSENBERG, Ivan, ŠPONER, Jiří, PLAVEC, Janez, TRANTÍREK, Lukáš. Insight into formation propensity of pseudocircular DNA G-hairpins. Nucleic acids research. 2021, vol. 49, iss. 4, str. 2317-2332. ISSN 0305-1048. https://academic.oup.com/nar/article/49/4/2317/6125665, DOI: 10.1093/nar/gkab029. [COBISS.SI-ID 54425859].
BIELSKUTE, Stase, PLAVEC, Janez, PODBEVŠEK, Peter. Oxidative lesions modulate G-quadruplex stability and structure in the human BCL2 promoter. Nucleic acids research. 2021, vol. 49, iss. 4, str. 2346-2356. ISSN 0305-1048. https://academic.oup.com/nar/article/49/4/2346/6130844, DOI: 10.1093/nar/gkab057. [COBISS.SI-ID 55258627]

Gregor Anderluh

LEBEN, Katja, STRMŠEK, Žiga, LEBAR, Tina, VERBIČ, Anže, DRAGOVAN, Matej, OMERSA, Neža, ANDERLUH, Gregor, JERALA, Roman. Binding of the transcription activator-like effector augments transcriptional regulation by another transcription factor. *Nucleic acids research*. 7 Jun. 2022, vol. 50, iss. 11, str. 6562–6574, ilustr. ISSN 0305-1048. https://academic.oup.com/nar/article/50/11/6562/6603662, DOI: 10.1093/nar/gkac454. [COBISS.SI-ID 120903171],
PIRC, Katja, CLIFTON, Luke A., YILMAZ, Neval, SALTALAMACCHIA, Andrea, MALLY, Mojca, SNOJ, Tina, ŽNIDARŠIČ, Nada, SRNKO, Marija, BORIŠEK, Jure, PODOBNIK, Marjetka, DERGANC, Jure, ANDERLUH, Gregor, et al. An oomycete NLP cytolysin forms transient small pores in lipid membranes. *Science advances*. 11 Mar. 2022, vol. 8, iss. 10, str. 1-12. ISSN 2375-2548. https://www.science.org/doi/10.1126/sciadv.abj9406, DOI: 10.1126/sciadv.abj9406. [COBISS.SI-ID 101707011],
LAURIA, Fabio, BERNABÒ, Paola, TEBALDI, Toma, GROEN, Ewout Joan Nicolaas, PERENTHALER, Elena, MANISCALCO, Federica, ROSSI, Annalisa, DONZEL, Deborah, CLAMER, Massimiliano, MARCHIORETTO, Marta, OMERSA, Neža, ORRI, Julia, DALLA SERRA, Mauro, ANDERLUH, Gregor, QUATTRONE, Alessandro, INGA, Alberto, GILLINGWATER, Thomas Henry, VIERO, Gabriella. SMN-primed ribosomes modulate the translation of transcripts related to spinal muscular atrophy. *Nature cell biology*. Oct. 2020, iss. 10, vol. 22, str. 1239-1251, ilustr. ISSN 1465-7392. https://www.nature.com/articles/s41556-020-00577-7, DOI: 10.1038/s41556-020-00577-7. [COBISS.SI-ID 30104323],
NI, Tao, JIAO, Fang, YU, Xiulian, ADEN, Saša, GINGER, Lucy, WILLIAMS, Sophie I., BAI, Fangfang, PRAŽÁK, Vojtěch, KARIA, Dimple, STANSFELD, Phillip J., ZHANG, Peijun, MUNSON, George, ANDERLUH, Gregor, SCHEURING, Simon, GILBERT, Robert J. Structure and mechanism of bactericidal mammalian perforin-2, an ancient agent of innate immunity. *Science advances*. 29 Jan. 2020, vol. 6, no. 5, eaax8286, str. 1-12, ilustr. ISSN 2375-2548. https://advances.sciencemag.org/content/6/5/eaax8286/tab-pdf, DOI: 10.1126/sciadv.aax8286. [COBISS.SI-ID 40402693]
KEŽAR, Andreja, KAVČIČ, Luka, PÓLAK, Martin, NOVÁČEK, Jiři, GUTIÉRREZ-AGUIRRE, Ion, TUŠEK-ŽNIDARIČ, Magda, COLL RIUS, Anna, STARE, Katja, GRUDEN, Kristina, RAVNIKAR, Maja, PAHOVNIK, David, ŽAGAR, Ema, MERZEL, Franci, ANDERLUH, Gregor, PODOBNIK, Marjetka. Structural basis for the multitasking nature of the potato virus Y coat protein. *Science advances*. 2019, vol. 5, no. 7, str. 1-13, ilustr. ISSN 2375-2548. https://advances.sciencemag.org/content/5/7/eaaw3808, DOI: 10.1126/sciadv.aaw3808. [COBISS.SI-ID 5135183]
NI, Tao, WILLIAMS, Sophie I., ADEN, Saša, ANDERLUH, Gregor, HARLOS, Karl, STANSFELD, Phillip J., GILBERT, Robert J. Structures of monomeric and oligomeric forms of the Toxoplasma gondii perforin-like protein 1. *Science advances*. 9. Mar. 2018, vol. 4, no. 3, str. eaaq0762-1-eaaq0762-8. ISSN 2375-2548. http://advances.sciencemag.org/content/4/3/eaaq0762/tab-pdf, DOI: 10.1126/sciadv.aaq0762. [COBISS.SI-ID 6357018].

FIZIOLOGIJA GOZDNEGA DREVJA IN OHRANJANJE GOZDNIH GENSKIH VIROV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fiziologija gozdnega drevja in ohranjanje gozdnih genskih virov
Course title:	Physiology of forest trees and conservation of forest genetic resources
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0644223

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	25	5	0	5	80	5

Nosilec predmeta/Lecturer:	Hojka Kraigher

Izvajalci predavanj:	Hojka Kraigher
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični /theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General requirements for inscription to doctoral studies

Vsebina:	Content (Syllabus outline):
1)izbrana poglavja iz fiziologije gozdnega drevja 2)izbrana poglavja iz ohranitvene biologije in ekologije 3)izbrana poglavja iz fiziologije in ekologije simbioz 4)struktura in funkcija korenin in koreninskih simbiontov 5)dinamika ogljika v gozdnih tleh in interakcije v mikorizosferi	1)selected chapters from physiology of forest trees 2)selected chapters from conservation biology and ecology 3)selected chapters from physiology and ecology of symbioses 4)structure and function of tree roots and root symbionts

6)biogeokemijski cikli, voda v tleh, fiziologija mineralne prehrane 7)fiziologija rasti in razvoja; gozdni reprodukcijski material 8)(miko)bioindikacija stresa v gozdnem drevju in gozdnih ekosistemih 9)monitoringi sprememb v gozdnih tleh in populacijah gozdnega drevja	5)carbon dynamics in forest soils and interactions in the mycorrhizosphere 6)biogeochemical cycles, water in the soil, physiology of mineral nutrition 7)physiology of growth and development; forest reproductive material 8)(myco)bioindication of stress in forest trees and forest ecosystems 9)monitorings of changes in forest soils and populations of forest trees

Temeljna literatura in viri/Readings:

TAIZ L., ZEIGER E. 2006. Plant Physiology 4th ed., Sinauer assoc. USA, 764 pp.
WAISEL Y., ESHEL A., KAFKAFI U. 2002. PLANT ROOTS. THE HIDDEN HALF. 3rd ed., Marcel Dekker inc., New York, Basel. 1120 str.
KRAIGHER H. 1996. Tipi ektomikorize - taksonomija, pomen in aplikacije = Types of ectomycorrhizae - their taxonomy, role and application. Zb. gozd. lesar., št. 49, str. 33-66
SMITH SE, READ DJ. 2008. Mycorrhizal Symbiosis, 3rd Ed. Acad. Press, London, 800 str.
COLEMAN DC, CROSSLEY DAJr, HENDRIX PF. 2004. Fundamentals of Soil Ecology, 2nd Ed. Elsevier, London, 385 str.
DIGHTON J. 2003. Fungi in Ecosystem Processes. Marcel Dekker, New York, 432 str.
BUSCOT F, VARMA A (Eds.). 2005. Microorganisms in Soils: Roles in Genesis and Functions, Springer, Heidelberg, 419 str
GUREVITCH J, SCHEINER SM, FOX G. 2006. The ecology of plants, 2nd ed., Sinauer assoc., USA, 574 pp.
URBANČIČ, M., SIMONČIČ, P., PRUS, T., KUTNAR, L.. Atlas gozdnih tal Slovenije. Ljubljana: Zveza gozdarskih društev Slovenije: GV: Gozdarski inštitut Slovenije, 2005. 100 str., ilustr. ISBN 961-6142-13-5.

Cilji in kompetence:	**Objectives and competences:**
Cilji predmeta so poglobiti razmevanje fiziologije gozdnega drevja, delovanja gozdnih tal, biologije gozdnih tal, interakcij v gozdnih tleh in mikorizosferi, mineralne prehrane gozdnega drevja, vodnih razmerij gozdnega drevja, pomena mikorize za rast in razvoj gozdnega drevja ter delovanje gozdnih ekosistemov, biodiverzitete v gozdnih tleh in pestrosti mikorize, mikobioindikacije stresa v gozdnih ekosistemih, osnov ohranitvene biologije in ekologije ter monitoringov sprememb v gozdnih tleh in populacijah gozdnega drevja. Študent bo pridobil kompetence s področja izbranih poglavij, kritičnega vrednotenja in vključevanja znanj v gozdnogospodarsko prakso in rabo naravnih virov ter v znanstveno-raziskovalno delo, metodologijo, reference in etiko znanstveno-raziskovalnega dela na izbranem področju.	The course aims to deepen the understanding of the physiology of forest trees, functioning and biology of forest soils, interactions in forest soils and mycorhizosphere, mineral nutrition of forest trees, water relations of forest trees, the importance of mycorrhiza for growth and development of forest trees and functioning of forest ecosystems, biodiversity in forest soils and diversity of mycorrhizal fungi, mycobioindication of stress in forest ecosystems, the basics of conservation biology and ecology, and monitoring of changes in forest soils and populations of forest trees. Students will gain competencies in the area of selected chapters, critical evaluation and integration of knowledge in forest management practices and use of natural resources and scientific research, methodology, references and ethics of scientific research in the chosen field.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Vključevanje znanj v sonaravno gozdnogospodarsko in detajlno gozdnogojitveno načrtovanje pod vplivi klimatskih sprememb, vplive gospodarjenja na gozdna tla in ekosisteme, kompleksnost bioindikacije stresa v gozdnih ekosistemih ter kompleksa monitoringov stanja in razvoja gozdov.	Knowledge and understanding: Integrating knowledge into sustainable forest management and detail silvicultural planning under climate change conditions, the effects of management on forest soils and ecosystems, the complexity of bioindication of stress in forest ecosystems and complex monitorings of the state and development of

Kritično vrednotenje konceptov gospodarjenja z gozdovi, obnove, pomena gozdov za globalno kroženje ogljika, pomena biodiverzitete in bioindikacije zdravja gozdov. S študijem domače in tuje literature ter uporabo internetnih brskalnikov si študent izpopolni sposobnost kritične in specializirane uporabe knjižnice in dokumentacijskih baz podatkov, pa tudi osnovne informacije in prakso o molekularnih bazah podatkov	forests. Critical evaluation of concepts of forest management, their regeneration with planting and seeding, the importance of forests in the global carbon cycle, the importance of biodiversity and bioindication of forest health. By studying domestic and foreign literature and the use of internet browsers the student shall improve the ability to selectively use libraries and documentation databases, as well as basic information and practice of molecular databases.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja potekajo na klasičen način ob uporabi računalnika in interneta. Vaje ali raziskovalno delo, ki vključujejo nekaj terenskih ogledov raziskovalnih ploskev, potekajo na področjih, ki so aktualna v gozdarstvu in sovpadajo z nadaljnjim izobraževanjem oz. raziskovalnimi interesi in potrebami slušateljev. Na osnovi izbora vaj oz. raziskovalnega dela, terenskih ogledov ali zaradi interesa študenta se izbere naslov seminarske naloge, ki jo pripravi študent samostojno in jo predstavi na najprimernejši način.	Lectures take place in the traditional manner using a computer and the Internet. Exercises or research work may involve visits to field research plots and are organized in areas that coincide with further education or research interests and needs of students. The student shall prepare a seminar, based on his/her interests and present it individually in the most appropriate manner.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Študent mora pripraviti seminar iz izbrane tematike in ga predstaviti. Za pristop k izpitu mora imeti uspešno predstavljen seminar in poročilo iz vaj / raziskovalnega dela. Iz predavanih vsebin opravi pisni izpit. Končna ocena je enojna in sestavljena enakovredno iz ocene pisnega izpita iz predavanj (konzultacij in študija priporočene literature) in združene ocene za seminar in poročilo o raziskovalnem delu.	100,00 %	The student must prepare a seminar on selected topics and present it individually. For the exam the seminar and exercises / research work should be positive. A written examination is based on the contents of the lectures. The final grade is single, based on the equally weighted grade from the written examination from lectures (consultations and study of recommended literature) and the combined score for the seminar and report on the practical research.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Hojka Kraigher

UNUK NAHBERGER, Tina, DAMJANIĆ, Rok, KRAIGHER, Hojka, GREBENC, Tine. Potential link between ectomycorrhizal community composition and host tree phenology. *Forests*. [Online ed.]. 2021, vol. 12, iss. 12, 12 str., ilustr. ISSN 1999-4907. https://doi.org/10.3390/f12121719, https://dirros.openscience.si/IzpisGradiva.php?id=14680, https://www.mdpi.com/1999-4907/12/12/1719, DOI: 10.3390/f12121719. [COBISS.SI-ID 90226435], [JCR, SNIP, WoS, Scopus]

MRAK, Tanja, ŠIBANC, Nataša, BRAILEY-JONES, Philip, ŠTRAUS, Ines, GRIČAR, Jožica, KRAIGHER, Hojka. Extramatrical mycelium and ectomycorrhizal community composition of Quercus pubescens in a Sub-Mediterranean stress-prone environment. *Frontiers in forests and global change*. vol. 4, article 599946, str. ISSN 2624-893X. https://doi.org/10.3389/ffgc.2021.599946, DOI: 10.3389/ffgc.2021.599946. [COBISS.SI-ID 51012867], [JCR, SNIP, WoS, Scopus do 10. 11. 2021: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,17]

kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCIE, Scopus, MBP (BIOABS, BIOPREW, ZR, PUBMED, ESCI, DOAJ); tip dela je verificiral

MILOVIĆ, Marina, ORLOVIĆ, Saša, GREBENC, Tine, BAJC, Marko, KOVAČEVIĆ, Branislav, KRAIGHER, Hojka. Ectomycorrhizal fungal community in mature white poplar plantation. *IForest*. 2021, vol. 14, iss. 6, str. 540-547. ISSN 1971-7458. https://doi.org/10.3832/ifor3827-014, https://dirros.openscience.si/IzpisGradiva.php?id=14647, DOI: 10.3832/ifor3827-014. [COBISS.SI-ID 87736579], [JCR, SNIP]

UNUK NAHBERGER, Tina, BENUCCI, Niccolo G. M., GREBENC, Tine, KRAIGHER, Hojka. Effect of earthworms on mycorrhization, root morphology and biomass of silver fir seedlings inoculated with black summer truffle (Tuber aestivum Vittad.). *Scientific reports*. 2021, vol. 11, article 6167, 11 str., ilustr. ISSN 2045-2322. https://doi.org/10.1038/s41598-021-85497-8, https://www.nature.com/articles/s41598-021-85497-8, http://dirros.openscience.si/IzpisGradiva.php?id=13786, DOI: 10.1038/s41598-021-85497-8. [COBISS.SI-ID 55992323], [JCR, SNIP, WoS do 20. 12. 2022: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,50, Scopus do 12. 12. 2022: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,50]

MRAK, Tanja, DOVČ, Natalija, GRIČAR, Jožica, HOSHIKA, Yasutomo, PAOLETTI, Elena, KRAIGHER, Hojka. Poplar root anatomy after exposure to elevated O3 in combination with nitrogen and phosphorus. *Trees*. 2021, vol. 35, iss. 4, str. 1233–1245, ilustr. ISSN 0931-1890. https://doi.org/10.1007/s00468-021-02111-0, https://link.springer.com/article/10.1007%2Fs00468-021-02111-0, DOI: 10.1007/s00468-021-02111-0. [COBISS.SI-ID 57686019], [JCR, SNIP, WoS do 29. 11. 2022: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,17, Scopus do 27. 7. 2022: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,17]

FIZIOLOGIJA IN MORFOLOGIJA RASTLIN – INTEGRATIVNI PRISTOP

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fiziologija in morfologija rastlin – integrativni pristop
Course title:	Physiology and Morphology of Plants- an Integrative Approach
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0566693
Koda učne enote na članici/UL Member course code:	0

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	30	0	0	10	190	10

Nosilec predmeta/Lecturer:	Marjana Regvar

Izvajalci predavanj:	Kristina Gruden, Marjana Regvar, Katarina Vogel Mikuš
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij	General prerequisites for enrolment in doctoral studies.

Vsebina:	**Content (Syllabus outline):**
Predmet obravnava zgradbo in delovanje rastlin na več ravneh biološke organizacije in pri tem povezuje številne vede in področja raziskav, ki obravnavajo zgradbo in delovanje rastlin: morfologijo in anatomijo, histologijo, biokemijo in predstavitev sodobnih analiznih metod v fiziologiji rastlin. Nedavni napredek v molekulski biologiji, vključno z	The course provides knowledge of the form and function of living organisms at levels of biological organization plants and covers a diverse array of fields in research including physiology, morphology and anatomy, histology, biochemistry and modern analytical approaches in plant physiology. The recent advances in molecular biology, including the

razkritjem zaporedja mnogih genomov, je priložnost za uporabo tega znanja. Novo znanje je pripomoglo k razumevanju, kako geni v kompleksnih sistemih omogočijo emergenčne lastnosti fenotipov. Interdisciplinarni pristop k raziskavam organizmov zahteva uporabo naprednih tehnologij, mikroskopije, spektroskopske analize, tehnike molekulske genetike in računalniške analize slik in signalov. Integracija znanja med številnimi ravnmi biologije je potrebno za razkrivanje temeljnih načel delovanja organizmov pod vplivom različnih biotskih in abiotskih dejavnikov. Integracija znanja je potrebna tudi za uporabo biologije v industriji in družbi.	sequencing of genomes, have provided an opportunity to use this information to understand how the genes enable emergent phenotypes in complex systems. Multi-disciplinary approach to studying organisms requires the ability to utilize advanced technologies such as microscopy, spectroscopic analyses, molecular genetics and computer assisted image and signal analysis. Integration of knowledge across levels of biological complexity is required for elucidating fundamental principles of biological function under different biotic and abiotic factors or as the basis for novel applications.

Temeljna literatura in viri/Readings:

Geoffrey M. Cooper. The cell, A Molecular Approach, 6th Edition, Boston University Suderland (MA), Sinauer Assoc. 2013
Russel Jones et al. The Molecular Life of Plants. Willey-Blackwell, ASPB, 2013
Lincoln Teiz, Eduardo Zeiger. Plant Physiology. Sinauer Assoc, 2010
John D. Bancroft, Marilyn Gamble. Theory and Practice of Histological Techniques, 6e. Churchill Livingstone, Elsevier, ISBN-13: 978-0443102790, 2008.
Tekoča periodika in zlasti pregledni članki s področij: fiziologije, anatomije, morfologije in raziskovalne tehnologije
Shah MA (2014) Mycorrhizas: Novel Dimensions in the Changing World, Springer, Berlin
Solanki, M. K., Kashyap, P. L., Kumari, B. (2020) Phytobiomes: Current Insights and Future Vistas, Elsevier
Smith, S. E. (2008) Mycorrhizal symbiosis, Academic Press
Revija/Journal: Mycorrhiza, Springer

Cilji in kompetence:	**Objectives and competences:**
Temeljni izobraževalni cilj je razumevanje mehanizmov delovanja organizmov ter njihove regulacije. Pri tem se povezujejo ravni od molekule in celice do odnosa organizmov z okoljem. Študent pridobi kompetence pri razumevanju procesov v rastlinah.	The educational aim of the course is to understand mechanisms that govern functioning of organisms and gain knowledge of their regulation. In this the levels of organisation from molecules and cells to interactions with the environment are considered. Students gain competences in understanding of processes in plants.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predviden študijski rezultat je nadgraditi in povezati znanje s področja fiziologije, anatomije, morfologije in uporaba novega znanja za razumevanje delovanja organizmov pod vplivom biotskih in abiotskih dejavnikov	The course is aiming to upgrade and integrate the competences and knowledge from the fields of physiology, anatomy, morphology, and to apply the acquired knowledge in understanding functions of organisms under adverse biotic and abiotic conditions

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusijske delavnice predstavljenih seminarjev, predstavitve v laboratorijih. Pri izvajanju sodelujejo vabljeni predavatelji. Izvedba je prilagojena raziskovalni tematiki študenta.	Lectures, workshops with seminars, lab presentations in cooperation with invited lecturers. The course is adjusted to the research field of the student.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni izpit iz tem predavanj.	50,00 %	Written examination
Predstavitev individualnega projekta	50,00 %	Project presentation

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

prof. dr. Marjana Regvar

prof. dr. Marjana Regvar

LIKAR, Matevž, STRES, Blaž, RUSJAN, Denis, VOGEL-MIKUŠ, Katarina, **REGVAR, Marjana**. Grapevine leaf ionome is shaped by soil factors and plant age. *Plant, soil and environment*. 2022, vol. 68, no. 9, str. 415–423 [COBISS.SI-ID 124604931]

KRANJC, Eva, MAZEJ, Darja, **REGVAR, Marjana**, DROBNE, Damjana, REMŠKAR, Maja. Foliar surface free energy affects platinum nanoparticle adhesion, uptake, and translocation from leaves to roots in arugula and escarole. *Environmental science. Nano*. 2018, vol. 5, no. 2, str. 520-532 [COBISS.SI-ID 31025447]

PONGRAC, Paula, TOLRÀ, Roser, HAJIBOLAND, Roghieh, VOGEL-MIKUŠ, Katarina, KELEMEN, Mitja, VAVPETIČ, Primož, PELICON, Primož, BARCELO, Juan, **REGVAR, Marjana**, POSCHENRIEDER, Charlotte. Contrasting allocation of magnesium, calcium and manganese in leaves of tea (Camellia sinensis (L.) Kuntze) plants may explain their different extraction efficiency into tea. *Food and chemical toxicology*. 2020, vol. 135, 11 str. [COBISS.SI-ID 32880423]

MRAVLJE, Jure, **REGVAR, Marjana**, STARIČ, Pia, ZAPLOTNIK, Rok, MOZETIČ, Miran, VOGEL-MIKUŠ, Katarina. Decontamination and germination of buckwheat grains upon treatment with oxygen plasma glow and afterglow. *Plants*. 2022, vol. 11, no. 10, str. 1-20. [COBISS.SI-ID 108848643]

ZDUNIĆ, Goran, LUKŠIĆ, Katarina, NAGY, Zora Annamaria, MUCALO, Ana, HANČEVIĆ, Katarina, RADIĆ, Tomislav, BUTORAC, Lukrecija, JAHNK, Gizella Gyorffyne, KISS, Erzsébet, LEDESMA-KRIST, Gloria, **REGVAR, Marjana**, LIKAR, Matevž, PILTAVER, Andrej, et al. Genetic structure and relationships among wild and cultivated grapevines from Central Europe and part of the Western Balkan Peninsula. *Genes*. Sept. 2020, vol. 11, iss. 9, str. [1]-15 [COBISS.SI-ID 111647491]]

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FIZIOLOGIJA IN MORFOLOGIJA ŽIVALI – INTEGRATIVNI PRISTOP

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fiziologija in morfologija živali – integrativni pristop
Course title:	Physiology and Morphology of Animals - an Integrative Approach
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0566745
Koda učne enote na članici/UL Member course code:	0

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	30	0	0	10	190	10

Nosilec predmeta/Lecturer:	Marko Kreft

Izvajalci predavanj:	Damjana Drobne, Gordana Glavan, Petra Golja, Marko Kreft, Jasna Štrus, Meta Virant - Doberlet, Primož Zidar
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General prerequisites for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Predmet obravnava zgradbo in delovanje živali na več ravneh biološke organizacije in pri tem povezuje številne vede in področja raziskav, ki obravnavajo zgradbo in delovanje živali in človeka: morfologijo in anatomijo, histologijo, etologijo, nevroznanost, kemijo, biomehaniko, fiziko, inženirstvo. Nedavni	The course provides knowledge of the form and function at levels of biological organization of animals and humans, and covers a diverse array of fields in research including physiology and ethology, morphology and anatomy, histology, neuroscience, chemistry, biomechanics, physics, engineering. The

napredek v molekulski biologiji, vključno z razkritjem zaporedja mnogih genomov, je priložnost za uporabo tega znanja. Novo znanje je pripomoglo k razumevanju, kako geni v kompleksnih sistemih omogočijo emergenčne lastnosti fenotipov. Interdisciplinarni pristop k raziskavam organizmov zahteva uporabo naprednih tehnologij, elektrofiziologije, mikroskopije, spektroskopske analize, tehnike molekulske genetike in računalniške analize slik in signalov. Integracija znanja med številnimi ravnmi biologije je potrebno za razkrivanje temeljnih načel delovanja organizmov pod vplivom različnih biotskih in abiotskih dejavnikov. Integracija znanja je potrebna tudi za uporabo biologije v industriji in družbi.	recent advances in molecular biology, including the sequencing of genomes, have provided an opportunity to use this information to understand how the genes enable emergent phenotypes in complex systems. Multi-disciplinary approach to studying organisms requires the ability to utilize advanced technologies such as electrophysiology, microscopy, spectroscopic analyses, molecular genetics and computer assisted image and signal analysis. Integration of knowledge across levels of biological complexity is required for elucidating fundamental principles of biological function under different biotic and abiotic factors or as the basis for novel applications.

Temeljna literatura in viri/Readings:

Cooper, Geoffrey M. ; Hausman, Robert E., The cell : a molecular approach. International 7th ed., New York : Sinauer Associates, Oxford, University Press, cop. 2018, ISBN - 978-1-60535-746-1; 1-60535-746-4, COBISS.SI-ID - 4884559
McArdle, William D. ; Katch, Frank I. ; Katch, Victor L. Exercise physiology : nutrition, energy, and human performance, Izdaja - 7th ed., Baltimore, MD : Wolters Kluwer/Lippincott Williams & Wilkins, cop. 2010 ISBN - 978-0-7817-9781-8; 0-7817-9781-0; 978-1-60831-859-9; 1-60831-859-1, COBISS.SI-ID - 1860563
John D. Bancroft, Marilyn Gamble. Theory and Practice of Histological Techniques, 6e. Churchill Livingstone, Elsevier, ISBN-13: 978-0443102790, 2008. COBISS.SI-ID - 62414593
Tekoča periodika in zlasti pregledni članki s področij: fiziologije, etologije, anatomije, morfologije in raziskovalne tehnologije

Cilji in kompetence:	**Objectives and competences:**
Temeljni izobraževalni cilj je razumevanje mehanizmov delovanja organizmov ter njihove regulacije. Pri tem se povezujejo ravni od molekule in celice do odnosa organizmov z okoljem. Študent pridobi kompetence pri razumevanju procesov v živalih in človeku.	The educational aim of the course is to understand mechanisms that govern functioning of organisms and gain knowledge of their regulation. In this the levels of organisation from molecules and cells to interactions with the environment are considered. Students gain competences in understanding of processes in animals and humans.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predviden študijski rezultat je nadgraditi in povezati znanje s področja fiziologije, anatomije, morfologije, etologije in uporaba novega znanja za razumevanje delovanja organizmov pod vplivom biotskih in abiotskih dejavnikov.	The course is aiming to upgrade and integrate the competences and knowledge from the fields of physiology, anatomy, morphology, ethology and to apply the acquired knowledge in understanding functions of organisms under adverse biotic and abiotic conditions.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusijske delavnice predstavljenih seminarjev, predstavitve v laboratorijih. Pri izvajanju sodelujejo vabljeni predavatelji. Izvedba je prilagojena raziskovalni tematiki študenta.	Lectures, workshops with seminars, lab presentations in cooperation with invited lecturers. The course is adjusted to the research field of the student.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni izpit iz tem predavanj	50,00 %	Written examination
Predstavitev individualnega projekta	50,00 %	Project presentation

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

prof. dr. Marko Kreft

UMEK, Nejc, HORVAT, Simon, CVETKO, Erika, KREFT, Marko, JANÁČEK, Jiří, KUBÍNOVÁ, Lucie, STOPAR PINTARIČ, Tatjana, ERŽEN, Ida. 3D analysis of capillary network in skeletal muscle of obese insulin-resistant mice. Histochemistry and cell biology. 2019, vol. 152, iss. 5, str. 323-331, ilustr. ISSN 0948-6143. DOI: 10.1007/s00418-019-01810-7.

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MEGLIČ, Andrej, ILIĆ, Marko, PIRIH, Primož, ŠKORJANC, Aleš, WEHLING, Martin F., KREFT, Marko, BELUŠIČ, Gregor. Horsefly object-directed polarotaxis is mediated by a stochastically distributed ommatidial subtype in the ventral retina. Proceedings of the National Academy of Sciences of the United States of America. 2019, 11 str., [in press], ilustr. ISSN 0027-8424. DOI: 10.1073/pnas.1910807116.

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KUHELJ, Ana, DE GROOT, Maarten, BLEJEC, Andrej, VIRANT-DOBERLET, Meta (2016). Sender-receiver dynamics in leafhopper vibrational duetting. Animal Behaviour, 114: 139-146, A'.
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doc. dr. Gordana Glavan

GLAVAN, Gordana, KOS, Monika, BOŽIČ, Janko, DROBNE, Damjana, SABOTIČ, Jerica, JEMEC KOKALJ, Anita. Different response of acetylcholinesterases in salt- and detergent-soluble fractions of honeybee haemolymph, head and thorax after exposure to diazinon. Comparative biochemistry and physiology.Part C, Toxicology & pharmacology. 2018, vol. 205, str. 8-14. ISSN 1532-0456. DOI: 10.1016/j.cbpc.2017.12.004.
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KOS, Monika, JEMEC KOKALJ, Anita, GLAVAN, Gordana, MAROLT, Gregor, ZIDAR, Primož, BOŽIČ, Janko, NOVAK, Sara, DROBNE, Damjana. Cerium (IV) oxide nanoparticles induce sublethal changes in honeybees after chronic exposure. Environmental science.Nano. 2017, vol. 4, iss. 12, str. 2297-2310. ISSN 2051-8153. http://dx.doi.org/10.1039/c7en00596b, DOI: 10.1039/c7en00596b.
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CIZELJ, Ivanka, GLAVAN, Gordana, BOŽIČ, Janko, OVEN, Irena, MRAK, Vesna, NARAT, Mojca. Prochloraz and coumaphos induce different gene expression patterns in three developmental stages of the Carniolan honey bee (Apis mellifera carnica Pollmann). Pesticide biochemistry and physiology. 2016, vol. 128, str. 68-75. ISSN 0048-3575. DOI: doi:10.1016/j.pestbp.2015.09.015.

doc. dr. Petra Golja

GOLJA, Petra, CETTOLO, Valentina, FRANCESCATO, Maria Pia. Calculation algorithms for breathby-breath alveolar gas exchange : the unknowns!. European journal of applied physiology. [Print ed.]. 2018, vol. 118, iss. 9, str. 1869-1876.
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LUČOVNIK, Miha, STARC, Gregor, GOLJA, Petra, VERDENIK, Ivan, ŠTUCIN GANTAR, Irena. Effects of perinatal factors on body mass index and physical fitness of school-age children = Vpliv perinatalnih dejavnikov na indeks telesne mase in gibalno učinkovitost osnovnošolcev. Zdravstveno varstvo : Slovenian journal of public health. [Tiskana izd.]. 2018, letn. 57, št. 2, str. 81-87.

ROBIČ PIKEL, Tatjana, STARC, Gregor, STREL, Janko, KOVAČ, Marjeta, BABNIK, Janez, GOLJA, Petra. Impact of prematurity on exercise capacity and agility of children and youth aged 8 to 18. Early human development. 2017, vol. 110, str. 39-45

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ZDEŠAR KOTNIK, Katja, ROBIČ PIKEL, Tatjana, GOLJA, Petra. Which method to use for a fast assessment of body fat percentage?. Physiological measurement. [Print ed.]. 2015, vol. 36, no. 7, str. 1453-1468.

FUNKCIONALNA EKOLOGIJA RASTLIN PRI SPREMLJANJU UČINKOV OKOLJSKIH SPREMEMB

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Funkcionalna ekologija rastlin pri spremljanju učinkov okoljskih sprememb
Course title:	Functional plant ecology in tracking the effects of environmental change
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	obvezni

Univerzitetna koda predmeta/University course code: 0644222

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	0	95	5

Nosilec predmeta/Lecturer: Klemen Eler

Izvajalci predavanj:	Franc Batič, Klemen Eler
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type: teoretični /theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies

Vsebina:	Content (Syllabus outline):
Seznanitev s funkcionalno ekologijo kot znanostjo, ki proučuje, katere lastnosti organizmov (funkcionalni znaki) definirajo preživetje, razširjenost in pogostnost (rastlinskih) organizmov v določenem okolju ter s tem narekujejo sestavo življenjskih združb in funkcioniranje ekosistemov. Obravnava različnih funkcionalnih lastnosti oz. znakov rastlin (anatomsko-morfoloških, fizioloških, fenoloških, razmnoževalnih, razširjevalnih, biokemijskih), ki	Introduction to functional ecology as a science that investigates properties of organisms (functional traits) which define the survival, distribution and abundance of (plant) organisms in a certain environment and thereby dictate the composition of biological communities and the functioning of ecosystems. Presentation of various functional plant traits (anatomical-morphological, physiological, phenological, reproductive, dispersal, biochemical),

definirajo ekološko nišo rastlin in kažejo na prilagojenost rastlinske vrste na določeno okolje. Variabilnost znakov, korelacije in izključevanja med posameznimi funkcionalnimi znaki rastlin kot osnova za funkcionalne klasifikacije ter definiranje rastlinskih funkcionalnih tipov in življenjskih strategij. Pregled nekaterih splošnih funkcionalnih klasifikacij rastlin (življenjske oblike, r-K selekcija pri rastlinah, CSR strategije po Grime-u, LHS tipi po Westoby-ju). Razpoložljivi podatkovni viri o rastlinskih funkcionalnih znakih. Funkcionalna pestrost v združbah in povezava s produktivnostjo in stabilnostjo ekosistema. Primeri funkcionalnega vrednotenja rastlinskih združb pri preučevanju dinamike vegetacije ob okoljskih spremembah (intenzifikacija kmetijske pridelave, opuščanje rabe, podnebne spremembe, evtrofikacija, onesnažila) z definiranjem indikatorskih znakov in ustrezno statistično obdelavo podatkov. Funkcionalni pristop v ekologiji invazivnih rastlin.	which define the ecological niche of plant speecies and indicate the adaptation of the plant species to a certain environment. Trait variability, correlations between traits and trade-offs as a basis for functional classifications and definition of plant functional types and life strategies. Overview of some general plant functional classifications (life forms, r-K selection in plants, CSR strategies according to Grime, LHS types according to Westoby). Available data sources on plant functional traits. Functional diversity in communities and the relationship with ecosystem productivity and resilience. Examples of functional evaluation of plant communities in studying the dynamics of vegetation in relation with environmental changes (agricultural intensification and abandonment, climate change, eutrophication, pollution) by defining indicator traits and by the use of appropriate statistical data processing. A functional approach in the ecology of invasive plants.

Temeljna literatura in viri/Readings:

Schulze E.-D., Beck E., Buchmann N., Clemens S., Müller-Hohenstein K., Scherer-Lorenzen M. 2019. Plant Ecology. Second Edition. Springer. 928 str. ISBN 978-3-662-56233-8 (izbrana poglavja) (https://link.springer.com/book/10.1007/978-3-662-56233-8?page=2#toc)

Perez-Harguindeguy, N., Diaz, S., Garnier, E., Lavorel, S., Poorter, H., Jaureguiberry, P., Bret-Harte, M. S., Cornwell, W. K., Craine, J. M., Gurvich, D. E., Urcelay, C., Veneklaas, E. J., Reich, P. B., Poorter, L., Wright, I. J., Ray, P., Enrico, L., Pausas, J. G., de Vos, A. C., ... Cornelissen, J. H. C. (2013). New handbook for standardised measurement of plant functional traits worldwide. Australian Journal of Botany, 61, 167-234. https://doi.org/10.1071/BT12225 (prosti dostop)

Drugi relevantni članki iz znanstvenih revij, dostopni preko konzorcijskih virov ali odprto-dostopni / Relevant articles from scientific journals, accessible through consortium resources or open-access (npr./e.g. Functional Ecology, Journal of Ecology, Journal of Vegetation Science, Oikos)

Cilji in kompetence:	**Objectives and competences:**
Cilji predmeta so študentu približati znanstvene osnove funkcionalne ekologije rastlin in ga seznaniti s prednostmi in omejitvami funkcionalne analize rastlinskih združb kot raziskovalnim pristopom za razumevanje in napovedovanje učinkov različnih okoljskih sprememb na združbe in ekosisteme.	The aims of the course are to introduce the student to the scientific basis of functional ecology of plants and to acquaint him with the advantages and limitations of the functional analysis of plant communities as a research approach for understanding and predicting the effects of various environmental changes on communities and ecosystems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent pozna splošne in *ad-hoc* funkcionalne klasifikacije rastlin ter presoja o smiselnosti njihove uporabe v raziskavah rastlinskih združb. Uporaba: Za določen namen raziskovanja zna izbrati indikativne funkcionalne znake rastlin, jih bodisi pridobiti iz podatkovnih virov ali ugotoviti samostojno, statistično ovrednotiti in pridobljene rezultate vsebinsko razložiti. Refleksija:	Knowledge and understanding: The student knows the general and a*d-hoc* functional classifications of plants and understands the reasonableness of their use in research of plant communities. Usage: For a specific purpose of research, he understands the selection of responsive plant functional traits, knows to obtain them eiher from existing data sources or determine them on his own, evaluates them statistically and explains the obtained results.

Funkcionalni pristop zna uporabiti v raziskavah odziva združb in ekosistemov na okoljske dejavnike v eksperimentalnih ali naravnih razmerah. Sposoben je načrtovanja raziskovalnega dela ter sinteze in analize dokaj širokega spektra znanj na področju botanike, rastlinske ekologije in ekosistemske ekologije, varstva okolja ter sorodnih ved. Prenosljive spretnosti: Pri predmetu se študent nauči povezovati podatke, znanja in informacije s področja ekologije in okoljskih znanosti ter jih uporabiti pri spremljanju učinkov različnh antropogenih sprememb okolja (raba ekosistemov, podnebne spremembe, upad biodiverzitete, invazivne vrste).	Reflection: Student knows how to use the functional approach in research on the response of communities and ecosystems to environmental factors in experimental or natural conditions. He is capable of planning research work and synthesizing and analyzing a wide range of knowledge in the field of botany, plant ecology and ecosystem ecology, environmental protection and related sciences. Transferable Skills: In the course, the student learns to connect data, knowledge and information from the field of ecology and environmental sciences and to use them in monitoring the effects of various human-induced environmental changes (land use, climate change, decline in biodiversity, invasive species).

Metode poučevanja in učenja:	**Learning and teaching methods:**
Študenti se na predavanjih seznanijo z osnovami funkcionalne analize rastlinskih združb. Te kasneje uporabijo v okviru projektnega dela (seminar), ki ga izvedejo na terenu ali v kontroliranih razmerah v laboratoriju oz. rastlinjaku. Rezultate projekta predstavijo	During the lectures, students learn about the basics of functional analysis of plant communities. This knowledge in used within their project work (seminar), which is carried out in the field or under controlled conditions in the laboratory or greenhouse. The results of the project are presented.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
izpit	50,00 %	exam
projektno delo	50,00 %	project work

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Klemen Eler

ELER, Klemen, KERMAVNAR, Janez, MARINŠEK, Aleksander, KUTNAR, Lado. Short-term changes in plant functional traits and understory functional diversity after logging of different intensities : a temperate fir-beech forest experiment. Annals of forest research. 2018, vol. 61, iss. 2, str. 223-241, ilustr. ISSN 1844-8135. https://doi.org/10.15287/afr.2018.1192, http://www.afrjournal.org/index.php/afr/article/view/1192, DOI: 10.15287/afr.2018.1192. [COBISS.SI-ID 5299878]

VODNIK, Dominik, GRIČAR, Jožica, LAVRIČ, Martina, FERLAN, Mitja, HAFNER, Polona, ELER, Klemen. Anatomical and physiological adjustments of pubescent oak (Quercus pubescens Willd.) from two adjacent sub-Mediterranean ecosites. Environmental and Experimental Botany. [Print ed.]. 2019, vol. 165, str. 208-2018, ilustr. ISSN 0098-8472. https://doi.org/10.1016/j.envexpbot.2019.06.010, DOI: 10.1016/j.envexpbot.2019.06.010. [COBISS.SI-ID 9243513]

HAMDIAH, Salem, KARAS, Lukáš, HOUŠKOVÁ, Kateřina, VAN DAMME, Kay, ATTORRE, Fabio, VAHALÍK, Petr, HABROVA, Hana, LVONČÍK, Samuel, ELER, Klemen, MADĚRA, Petr. Seed viability and potential germination rate of nine endemic Boswellia taxa (Burseraceae) from Socotra Island (Yemen). Plants. 2022, vol. 11, iss. 11, art. 1418, 21 str., ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/11/11/1418, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=144414, DOI: 10.3390/plants11111418. [COBISS.SI-ID 142435075]

GRIČAR, Jožica, JEVŠENAK, Jernej, GIAGLI, Kyriaki, ELER, Klemen, TSALAGKAS, Dimitrios, GRYC, Vladimir, VAVRČÍK, Hanuš, ČUFAR, Katarina, PRISLAN, Peter. Temporal and spatial variability of phloem structure in Picea abies and Fagus sylvatica and its link to climate. Plant, cell & environment. 2024, vol. 47, iss. 4, str. 1285-1299. ISSN 1365-3040. https://onlinelibrary.wiley.com/doi/full/10.1111/pce.14811, DOI: 10.1111/pce.14811. [COBISS.SI-ID 181704707]

ČOP, Jure, ELER, Klemen. Effect of fertiliser application and cutting regime on temporal differentiation of mesic semi-natural grassland vegetation. Italian journal of agronomy. 2019, vol. 14, no. 3, str. 153-161, ilustr. ISSN 1125-4718. DOI: 10.4081/ija.2019.1405. [COBISS.SI-ID 9280377]
HAMDIAH Salem, ELER Klemen, VAN DAMME Kay, ATTORRE Fabio, LA MONTAGNA Dario, DE SANCTIS Michele, SHANEYEHEN Mohammed, AMAR Mohammed, DANSO MARFO Theodore, MADĚRA Petr. Overgrazing strongly impedes the natural regeneration of the endemic Boswellia species on Socotra Island. Journal of Forest Science, 2024, 70(5): 249-263. DOI: 10.17221/3/2024-JFS. https://jfs.agriculturejournals.cz/artkey/jfs-202405-0004_overgrazing-strongly-impedes-the-natural-regeneration-of-the-endemic-boswellia-species-on-socotra-island.php

Franc Batič

1. ROZMAN, Andrej, DIACI, Jurij, **BATIČ, Franc**. Functional analysis of vegetation on alpine treeline ecotone in the Julian and Kamnik-Savinja Alps in Slovenia. *European journal of forest research (Print)*, ISSN 1612-4669, 2013, vol. 132, iss. 4, 579-591, ilustr. http://dx.doi.org/10.1007/s10342-013-0691-4, doi: 10.1007/s10342-013-0691-4. [COBISS.SI-ID 3706790], [JCR, SNIP, WoS do 30. 9. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 30. 9. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]
2. LESKOVŠEK, Robert, ELER, Klemen, **BATIČ, Franc**, SIMONČIČ, Andrej. The influence of nitrogen, water and competition on the vegetative and reproductive growth of common ragweed (Ambrosia artemisiifolia L.). *Plant ecology*, ISSN 1385-0237, 2012, vol. 213, no. 5, str. 769-781, ilustr., doi: 10.1007/s11258-012-0040-6. [COBISS.SI-ID 3833448], [JCR, SNIP, WoS do 5. 6. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 25. 4. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]
3. FERLAN, Mitja, ALBERTI, G., ELER, Klemen, **BATIČ, Franc**, PERESSOTTI, Alessandro, MIGLIETTA, Francesco, ZALDEI, A., SIMONČIČ, Primož, VODNIK, Dominik. Comparing carbon fluxes between different stages of secondary succession of a karst grassland. *Agriculture, ecosystems & environment*, ISSN 0167-8809. [Print ed.], 2011, vol. 140, no. 1/2, str. 199-207, ilustr. http://dx.doi.org/10.1016/j.agee.2010.12.003, doi: 10.1016/j.agee.2010.12.003. [COBISS.SI-ID 3086246], [JCR, SNIP, WoS do 29. 10. 2013: št. citatov (TC): 4, čistih citatov (CI): 2, normirano št. čistih citatov (NC): 3, Scopus do 9. 10. 2013: št. citatov (TC): 5, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 4]
4. GRABNER, Boštjan, RIBARIČ-LASNIK, Cvetka, ROMIH, Nadja, PFEIFHOFER, Hartwig W., **BATIČ, Franc**. Bioaccumulation capacity for Pb, Cd and Zn from polluted soil in selected species of the Brassicaceae family in different vegetation types. *Phyton*, ISSN 0079-2047, 2011, vol. 50, fasc. 2, str. 287-300. [COBISS.SI-ID 6552697], [JCR, SNIP, WoS do 5. 5. 2011: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 11. 5. 2011: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]
5. MRAK, Tanja, JERAN, Zvonka, **BATIČ, Franc**, DI TOPPI, Luigi Sanitá. Arsenic accumulation and thiol status in lichens exposed to As(V) in controlled conditions. *Biometals*, ISSN 0966-0844, 2010, vol. 23, str. 207-219. [COBISS.SI-ID 23151911], [JCR, SNIP, WoS do 17. 1. 2013: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 1, Scopus do 24. 10. 2012: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 1]
6. ŠIRCELJ, Helena, MIKULIČ PETKOVŠEK, Maja, **BATIČ, Franc**. Antioxidants in spring leaves of Oxalis acetosella L. *Food chemistry*, ISSN 0308-8146. [Print ed.], 2010, vol. 123, iss. 2, str. 351-357. http://dx.doi.org/10.1016/j.foodchem.2010.04.042, doi: 10.1016/j.foodchem.2010.04.042. [COBISS.SI-ID 6283897], [JCR, SNIP, WoS do 4. 6. 2013: št. citatov (TC): 2, čistih citatov (CI): 2, normirano št. čistih citatov (NC): 2, Scopus do 1. 5. 2013:

FUNKCIONIRANJE IN ZDRAVJE TAL

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Funkcioniranje in zdravje tal
Course title:	Soil health and functioning
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037245
Koda učne enote na članici/UL Member course code:	3747

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	20	0	0	190	10

Nosilec predmeta/Lecturer:	Domen Leštan

Izvajalci predavanj:	Domen Leštan
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	**Content (Syllabus outline):**
Pregled osnovnih kemijskih, biokemijskih, fizikalnih in bioloških parametrov in pokazateljev kakovosti zdravja tal. Tla kot habitat. Biodiverziteta in funkcije tal. Interakcije med organizmi in procesi v tleh. Biotski indikatorji kakovosti in zdravja tal. Vpliv rabe tal in kmetijskih praks na kakovost in funkcioniranje tal.	Review of the basic chemical, biochemical, phsical and biological principles and indicators of soil quality and health. Soil as Habitat. Soil Biodiversity and functions. Organism interaction and soil processes. Bioindicators of soil quality and health. Effects of land use and agronomic practices on soil quality and soil health.

Vpliv onesnažil, fizikalnih, naravnih in antropogenih dejavnikov in procesov degradacije na kakovost in zdravje tal. Problematika urbanih tal. Zakonodaja iz področja varovanja tal. Remediacija onesnaženih tal in metode rehabilitacije in revitalizacije degradiranih tal. Podrobneje bomo obravnavali poglavja: Kemije in biokemije organske snovi tal; Ravnotežja na faznih mejah; Sorpcijo na površinske funkcionalne skupine in komplekse; Oksidacijsko-redukcijske reakcije v tleh in potenciale; Proteolitske reakcije Al in Fe oksidov, karbonatno ravnotežje; Biokemijske reakcije in vloga pri procesih geneze in kroženja talnih komponent; Kinetika kemijskih in biokemijskih reakcij in procesov v tleh; Izbrana poglavja ekologije tal. Recikliranje hranil, puferna in samočistilna sposobnost tal, ekosistemska samo-regulacija rastlinskih bolezni in škodljivcev. Stabilnost talnega ekosistema, odpornost na motnje in prožnost mikrobne združbe.	The effect of contaminants, physical factors and natural and anthropogenic processes of soil degradation on soil quality and soil functioning. Specifics of urban soils. Regulations and legislation on soil protection. Remediation of contaminated soil and methods of rehabilitation and revitalization of degraded soils. More detailed will be discussed on: Chemistry and biochemistry of organic soil substances, Equilibrium at phase boundaries, sorption on surface functional groups and complexes; Oxidation-reduction reactions in soil and potentials, Pproteolytic reactions of Al and Fe oxides, carbonate balance; Biochemical reactions: role in processes of genesis and circulation of soil components; Kinetics of chemical and biochemical reactions and processes in soils; Selected chapters of soil ecology. Recycling of nutrients, buffering and decontamination, ecosystem self-regulation of plant diseases and pests. Stability of soil ecosystem, resistance and resilience of soil microbial community.

Temeljna literatura in viri/Readings:

revijalni članki s področja, tekoča periodika, druga učna gradiva…
Priporočena literatura:
Brady, N.C., Weil, R.R. 2002. The Nature and Properties of Soils,13ed. Prentice Hall, Upper Saddle River, ISBN 0-13-016763-0
Pierzynski,G.M., Sims, T., Vance, G. 2004. Soils and Environmental Quality, 3rd. ed. CRC Press, Boca Raton. ISBN 10-8493-1616-2
Sparks, D.L. 2003. Environmental Soil Chemistry. Academic Press, San Diego. ISBN 0-12-656446-9
Wall, D.H., 2012. Soil Ecology and Ecosystem services, Oxford University Press, ISBN 978-0-19-957592-3
Bloem J., Hopkins D.W., Benedetti A., 2008. Microbiological Methods for Assessing Soil Quality. ISBN 0-85199-098-3.

Cilji in kompetence:	**Objectives and competences:**
Tla so osnovni substrat v kmetijstvu in bistven del okolja. Pri raziskavah prehrane rastlin, uvajanju sodobnih agronomskih praks in pri raziskavah varstva in sanacije degradiranih oziroma onesnaženih tal je nujno dobro poznavanje konceptov funkcioniranja in zdravja tal, ki se odraža v kemijskih, biokemijskih, fizikalnih in bioloških lastnosth in procesih v tleh.	Soils are the basic substrate in agriculture and an essential part of the environment. In studying the nutrition of plants, introducing contemporary agronomic practices and in researching the protection and sanation of degraded or polluted soils it is crucial to be well acquainted with the functioning of the soil, which is to a large extent dependent on the chemical, biochemical, physical and biological properties and processes in the soil.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Predmet omogoča študentom poglobljen vpogled v lastnosti talnih komponent, reakcij, procesov in interakcij, ki usmerjajo delovanje tal kot tridelnega sistema trdne, tekoče in plinaste faze ter kot specifičnega ekosistema. Hkrati jih seznani z	Knowledge and understanding: The subject enables the student an in-depth insight into the properties of soil components, reactions and processes that direct the functioning of soils as a tripartite system of solid, liquid and gaseous phases and specific ecosystem. At the same time, it acquaints

metodami in inštrumenti, ki se uporabljajo pri tovrstnih raziskavah.	them with methods and instruments used in this kind of research.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, laboratorijske vaje, samostojno delo	Lectures, seminars, laboratory exercises, individual work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
- Ustni izpit iz predavanj in vaj	50,00 %	- Oral examination from lectures and exercises
- Ocena seminarja v povezavi s samostojnim delom	50,00 %	- Assessment of seminar connected with the student's individual work.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Domen Leštan:

MORALES ARTEAGA, Juan Francisco, KAURIN, Anela, LEŠTAN, Domen. Removal of toxic metals from sewage sludge by EDTA in a closed-loop washing process. Chemosphere. [Print ed.]. 2022, vol. 307, pt. 2, 135917, 9 str., ilustr. ISSN 0045-6535. https://www.sciencedirect.com/science/article/pii/S0045653522024109, DOI: 10.1016/j.chemosphere.2022.135917. [COBISS.SI-ID 122208003], [JCR, SNIP, WoS, Scopus do 5. 2. 2023: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,33]

MORALES ARTEAGA, Juan Francisco, GLUHAR, Simon, KAURIN, Anela, LEŠTAN, Domen. Simultaneous removal of arsenic and toxic metals from contaminated soil : Laboratory development and pilot scale demonstration. Environmental pollution. [Print ed.]. 2022, vol. 294, art. no. 118656, str. 1-12. ISSN 0269-7491. DOI: 10.1016/j.envpol.2021.118656. [COBISS.SI-ID 88795907], [JCR, SNIP, WoS do 28. 11. 2022: št. citatov (TC): 5, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 1,00, Scopus do 13. 2. 2023: št. citatov (TC): 7, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 1,50]

KAURIN, Anela, GLUHAR, Simon, MAČEK, Irena, KASTELEC, Damijana, LEŠTAN, Domen. Demonstrational gardens with EDTA-washed soil. Part II, Soil quality assessment using biological indicators. Science of the total environment. 2021, vol. 792, str. 1-9 (148522). ISSN 0048-9697. DOI: 10.1016/j.scitotenv.2021.148522. [COBISS.SI-ID 68311811], [JCR, SNIP, WoS do 29. 11. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40, Scopus do 29. 11. 2022: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40]

GLUHAR, Simon, KAURIN, Anela, FINŽGAR, Neža, GERL, Marko, KASTELEC, Damijana, LEŠTAN, Domen. Demonstrational gardens with EDTA-washed soil. Part I, Remediation efficiency, effect on soil properties and toxicity hazards. Science of the total environment. 2021, vol. 792, str. 1-12 (149060). ISSN 0048-9697. DOI: 10.1016/j.scitotenv.2021.149060. [COBISS.SI-ID 72788227], [JCR, SNIP, WoS do 3. 1. 2023: št. citatov (TC): 9, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 1,00, Scopus do 7. 2. 2023: št. citatov (TC): 12, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 1,17]

GLUHAR, Simon, KAURIN, Anela, VODNIK, Dominik, KASTELEC, Damijana, ZUPANC, Vesna, LEŠTAN, Domen. Demonstration gardens with EDTA-washed soil. Part III, Plant growth, soil physical properties and production of safe vegetables. Science of the total environment. 2021, vol. 792, str. 1-14 (148521). ISSN 0048-9697. DOI: 10.1016/j.scitotenv.2021.148521. [COBISS.SI-ID 68308739], [JCR, SNIP, WoS do 29. 11. 2022: št. citatov (TC): 5, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 0,50, Scopus do 27. 11. 2022: št. citatov (TC): 5, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 0,50]

GLUHAR, Simon, KAURIN, Anela, LEŠTAN, Domen. Soil washing with biodegradable chelating agents and EDTA : Technological feasibility, remediation efficiency and environmental sustainability. Chemosphere. [Print ed.]. okt. 2020, vol. 257, article 127226, str. 1-8, ilustr. ISSN 0045-6535. https://www.sciencedirect.com/science/article/pii/S0045653520314193?via%3Dihub, DOI: 10.1016/j.chemosphere.2020.127226. [COBISS.SI-ID 29308419], [JCR, SNIP, WoS do 27. 1. 2023: št. citatov (TC): 42, čistih citatov (CI): 38, čistih citatov na avtorja (CIAu): 12,67, Scopus do 16. 1. 2023: št. citatov (TC): 45, čistih citatov (CI): 41, čistih citatov na avtorja (CIAu): 13,67]

KAURIN, Anela, GLUHAR, Simon, TILIKJ, Natasha, LEŠTAN, Domen. Soil washing with biodegradable chelating agents and EDTA : Effect on soil properties and plant growth. Chemosphere. [Print ed.]. Dec. 2020, vol. 260, article 127673, str. 1-10, ilustr. ISSN 0045-6535. https://www.sciencedirect.com/science/article/pii/S0045653520318683?via%3Dihub, DOI: 10.1016/j.chemosphere.2020.127673. [COBISS.SI-ID 29306627], [JCR, SNIP, WoS do 14. 12. 2022: št. citatov (TC): 26, čistih citatov (CI): 23, čistih citatov na avtorja (CIAu): 5,75, Scopus do 18. 1. 2023: št. citatov (TC): 31, čistih citatov (CI): 28, čistih citatov na avtorja (CIAu): 7,00]

GLUHAR, Simon, KAURIN, Anela, GRUBAR, Tina, PROSEN, Helena, LEŠTAN, Domen. Dissipation of mecoprop-P, isoproturon, bentazon and S-metolachlor in heavy metal contaminated acidic and calcareous soil before and after EDTA-based remediation. Chemosphere. [Print ed.]. 2019, no. 124513, vol. 237, str. 1-9. ISSN 0045-6535. DOI: 10.1016/j.chemosphere.2019.124513. [COBISS.SI-ID 9268857], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40, Scopus do 22. 1. 2023: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40]

KAURIN, Anela, ČERNILOGAR, Zarja, LEŠTAN, Domen. Revitalisation of metal-contaminated, EDTA-washed soil by addition of unpolluted soil, compost and biochar: Effects on soil enzyme activity, microbial community composition and abundance. Chemosphere. [Print ed.]. 2018, vol. 193, str. 726-736. ISSN 0045-6535. DOI: 10.1016/j.chemosphere.2017.11.082. [COBISS.SI-ID 8875129], [JCR, SNIP, WoS do 1. 1. 2023: št. citatov (TC): 60, čistih citatov (CI): 52, čistih citatov na avtorja (CIAu): 17,33, Scopus do 24. 12. 2022: št. citatov (TC): 60, čistih citatov (CI): 52, čistih citatov na avtorja (CIAu): 17,33]

GLUHAR, Simon, JEŽ, Erika, LEŠTAN, Domen. The use of zero-valent Fe for curbing toxic emissions after EDTA-based washing of Pb, Zn and Cd contaminated calcareous and acidic soil. Chemosphere. [Print ed.]. 2018, vol. 215, str. 482-489. ISSN 0045-6535. DOI: 10.1016/j.chemosphere.2018.10.074. [COBISS.SI-ID 9077369], [JCR, SNIP, WoS do 19. 12. 2022: št. citatov (TC): 20, čistih citatov (CI): 11, čistih citatov na avtorja (CIAu): 3,67, Scopus do 21. 1. 2023: št. citatov (TC): 21, čistih citatov (CI): 12, čistih citatov na avtorja (CIAu): 4,00]

GEOGRAFSKI INFORMACIJSKI SISTEMI KOT RAZISKOVALNO ORODJE V BIOLOGIJI IN VARSTVU NARAVE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geografski informacijski sistemi kot raziskovalno orodje v biologiji in varstvu narave
Course title:	Geographic information systemsas a research tool for biology and nature conservation
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037275
Koda učne enote na članici/UL Member course code:	3777

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	20	0	0	85	5

Nosilec predmeta/Lecturer:	Maja Zagmajster

Izvajalci predavanj:	Tomaž Skrbinšek, Maja Zagmajster
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions to enroll in Doctoral Study Programme.

Vsebina:	Content (Syllabus outline):
Prikaz prostorskih podatkov: koordinatni sistemi, projekcije, georefenciranje. Urejanje podatkov in prostorske podatkovne baze. Osnove GIS: tipi podatkov, prikaz podatkov, izdelava kart.	Displaying spatial data: coordinate systems, geographic projections, georeferencing. Data management and spatial databases. GIS basics: data types, data presentation, map production.

Analize v GIS: analize razdalj, prostorske razporeditve, prostorske avtokorelacije, prostorska algebra. Uporaba GIS-a v prostorskih raziskavah in naravovarstvu.	Analyses in GIS: analyses of distances, spatial distributions, spatial autocorrelation, spatial algebra. Application of GIS in spatial studies and nature conservation

Temeljna literatura in viri/Readings:

Internetna učna gradiva, za rabo programov GIS:
- QGIS: https://docs.qgis.org/3.28/en/docs/gentle_gis_introduction/index.html
- ArcGIS: https://www.esri.com/en-us/what-is-gis/overview

Revijalni članki s področja, internetna učna gradiva.
Internet learning tutorials, for the use of the GIS programmes:
- QGIS: https://docs.qgis.org/3.28/en/docs/gentle_gis_introduction/index.html
- ArcGIS: https://www.esri.com/en-us/what-is-gis/overview

Journal articles from the study field, internet tutorials.

Cilji in kompetence:	**Objectives and competences:**
Seznaniti študente z uporabo geografskih informacijskih sistemov in prostorskih podatkovnih baz, da bodo lahko samostojno in kompetentno uporabljali in analizirali prostorske podatke za potrebe lastnih raziskav.	To introduce the students to geographic information systems and spatial databases and build competence for independent use and analysis of spatial data in their own research.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: - osnov kartografije in izdelave kart - principov priprave in obdelave prostorskih podatkov, - posebnosti prostorskih analiz in modeliranj. Znanje praktične uporabe izbranega GIS programskega paketa, sposobnost prenosa praktičnih izkušenj na druge GIS programe. Znanje praktične uporabe GIS orodij pri reševanju lastnih raziskovalnih vprašanj.	Knowledge and understanding: - of the basics of cartography and map production, - of the principles of spatial data preparation and analyses, - of the specifics of spatial analyses and modelling. Ability to use the chosen GIS software; based on experiences of working with it, being able to work with other GIS software. Being able to use GIS tools in own research.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja: teoretične osnove za razumevanje prikaza in analize prostorskih podatkov. **Praktično delo (Vaje)**: učenje preko praktičnega dela s programskim paketom QGIS. Vodeno delo na računalnikih. **Seminar**: izdelava seminarja iz teme doktorske disertacije študenta ali tematskega sklopa po njegovem/njenem izboru/zanimanju.	**Lectures**: theoretical foundation for understanding visualization and analysis of spatial data. **Practical work (Tutorial)**: hands-on learning though practical work with QGIS software. Guided practical work with computers. **Seminar**: production of a seminar. The topic is selected by the student, either from his/her doctoral dissertation or from other interests.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar	100,00 %	Seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

BORKO, Špela, ALTERMATT, Florian, ZAGMAJSTER, Maja, FIŠER, Cene. 2022. A hotspot of groundwater amphipod diversity on a crossroad of evolutionary radiations. *Diversity and distributions*. DOI: 10.1111/ddi.13500.

ZAGMAJSTER, Maja, POLAK, Slavko, FIŠER, Cene. Postojna-Planina cave system in Slovenia, a hotspot of subterranean biodiversity and a cradle of speleobiology. *Diversity*. 2021, vol. 13, iss. 6, str. 1-18, DOI: 10.3390/d13060271.

PREMATE, Ester, ZAGMAJSTER, Maja, FIŠER, Cene. Inferring predator-prey interaction in the subterranean environment : a case study from Dinaric caves. *Scientific reports*. 04 November 2021, vol. 11, str. 1-9, ilustr. DOI: 10.1038/s41598-021-01249-8.

LUKIĆ, Marko, DELIĆ, Teo, PAVLEK, Martina, DEHARVENG, Louis, ZAGMAJSTER, Maja. Distribution pattern and radiation of the European subterranean genus Verhoeffiella (Collembola, Entomobryidae). *Zoologica scripta*. 2020, vol. 49, iss. 1, str. 86-100. DOI: 10.1111/zsc.12392.

BREGOVIĆ, Petra, FIŠER, Cene, ZAGMAJSTER, Maja. Contribution of rare and common species to subterranean species richness patterns. *Ecology and evolution*. 2019, vol. 9, iss. 20, str. 11606-11618, DOI: 10.1002/ece3.5604.

EME, David, ZAGMAJSTER, Maja, DELIĆ, Teo, FIŠER, Cene, FLOT, Jean-François, KONECNY-DUPRÉ, Lara, PÁLSSON, Snæbjörn, STOCH, Fabio, ZAKŠEK, Valerija, DOUADY, Christophe J., MALARD, Florian. Do cryptic species matter in macroecology? Sequencing European groundwater crustaceans yields smaller ranges but does not challenge biodiversity determinants. *Ecography*. 2018, vol. 41, iss. 2, str. 424-436., DOI: 10.1111/ecog.02683.

Tomaž Skrbinšek

Jerina K, Jonozovič M, Krofel M, Skrbinšek T (2013) Range and local population densities of brown bear Ursus arctos in Slovenia. *European Journal of Wildlife Research*, **59**, 459-467.

Karamanlidis A, Stojanov A, Gabriel Hernando M, Ivanov G, Kocijan I, Melovski D, Skrbinšek T, Zedrosser A (2014) Distribution and genetic status of brown bears in FYR Macedonia: implications for conservation. *Acta Theriologica*, **59**, 119-128.

Krofel M, Skrbinšek T, Kos I (2012) Use of GPS location clusters analysis to study predation, feeding, and maternal behavior of the Eurasian lynx. *Ecol Res*, 1-14.

Milner-Gulland EJ, Arroyo B, Bellard C, Blanchard J, Bunnefeld N, Delibes-Mateos M, Edwards C, Nuno A, Palazy L, Reljic S, Riera P, Skrbinsek T (2010) New directions in management strategy evaluation through cross-fertilization between fisheries science and terrestrial conservation. *Biology Letters*, **6**, 719-722.

Sindičić M, Polanc P, Gomerčić T, Jelenčič M, Huber Đ, Trontelj P, Skrbinšek T (2013) Genetic data confirm critical status of the reintroduced Dinaric population of Eurasian lynx. *Conservation Genetics*, **14**, 1009-1018.

Krofel M, Skrbinšek T, Kljun F, Potočnik H, Kos I (2009) The killing technique of Eurasian lynx. *Belgian Journal of Zoology*, **139**, 2.

GOZDNA TEHNIKA IN GOZDNO DELO

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Gozdna tehnika in gozdno delo
Course title:	Forest Techniques and Forest Work
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037338
Koda učne enote na članici/UL Member course code:	3841

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	5	90	5

Nosilec predmeta/Lecturer:	Igor Potočnik

Izvajalci predavanj:	Janez Krč, Igor Potočnik
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Tehnološka obdobja, značilnosti in produktivnost dela. Svetovni trendi razvoja tehnik in tehnologij v gozdarstvu. Izbira tehnoloških modelov in delovne razmere. Energetska učinkovitost gozdarskih tehnologij in možnosti za presojo emisij toplogrednih plinov. Vplivi tehnologij na okolje (tla, sestoj, emisije, vodni viri) in okolju prilagojene tehnologije pridobivanja gozdnih proizvodov. Gozdna in lesna biomasa. Organizacija logističnih procesov v gozdni	Technological periods, characteristics and prodictivity of work. Worl trends in development of techniques and technologies in forestry. Choise of technological models and worjing conditions. Energy efficiency of forest technologies and option of evaluation of greenhouse effect gases. Impact of technologies on environment (soil, stand, emisions, water sources) and close to nature technologies of harvesting. Forest and wood biomass. Organization of logistic processes

proizvodnji. Uporaba informacijsko komunikacijskih tehnologij (IKT) pri načrtovanju del v gozdni proizvodnji. Posebnosti organizacije in izvedbe gozdarskih del na zasebni posesti in državni posesti. Človeški viri v gozdni proizvodnji. Povezovanje procesov na področju gozdarstva in primarne predelave lesa. Gozdno gradbeništvo. Vozno tehnične značilnosti gozdnih cest. Tehnološki modeli spravila lesa in polaganje cestnega omrežja. Optimalna gostota gozdnih cest v večnamenskem gozdu. Posebni primeri mnogonamenskega odpiranja gozdov (zasebni gozdovi, hitrorastoči nasadi, požarno ogroženi biotopi, sanacije po ujmah prizadetih področij). Uporaba informacijsko komunikacijskih tehnologij (IKT) in GPS tehnologij pri polaganju, trasiranju in projektiranju gozdnih cest. Teorija nezgod pri delu. Analiza delovnih nezgod. Ukrepi za zmanjšanje verjetnosti za nastanek delovnih nezgod. Obremenitve delovnega okolja na človeka v gozdni proizvodnji. Pulz kot merilo težavnosti dela. Ugotavljanje težavnosti dela v realnem času. Obremenitve naravnega okolja zaradi gozdne proizvodnje in mnogonamenske rabe gozda s hrupom.	in in forest production. Use of IT in planing forest production processes. Particularities in organization and implementation of forest work on private and state owned forest property. Human resources in forest production. Integration of processes in the field of forestry and primary wood processing. Forest engineering. Construction characteristics of forest roads. Tehnological model of skidding and setting up of forest road network. Optimal density of forest road in multipurposed forest. Special cases of multipurposed forest openning up (private forests, fast growing plantations, fire endangered biotopes, rehabilitation of affected areas after storms). Use of IT and GPS technologies in laying out, setting up and projecting of forest roads. Theory of accidents in forestry. Analysis of accidents at work. Measures for reducing probability for occuranbce of work accident. Work load on human in forest production. Pulse as a measure of phisical load of work. Determination of work load in real time. Pollution of natural environment due to forest production and multipurposed forest with noise.

Temeljna literatura in viri/Readings:

-Samset, I.1985. Winch and Cable Systems. Martinus Nijhoff/Dr.Junk Publ., Dordrecht Netherland, p.539
-REFA-Fachausschuss Forstwirtschaft. 2008. Organisation in der Forstwirtschaft. Weinheim, Diesbach, 283 str.
-Sundberg U./Silversides C.R. 1988. Operational Efficency in Forestry, Vol. 2 Practice.- Kluwer Academic Publ., Dordrecht, Boston, London, 169 s.

Priporočena literatura:

-Sundberg U./Silversides C.R. 1988. Operational Efficency in Forestry, Vol. 1 Analysis.- Kluwer Academic Publ., Dordrecht, Boston, London, 219 s.
-Environmental Noise. Brüel & Kjær Sound & Vibration Measurement A/S, 64 str.
- revijalni članki s področja, tekoča periodika ter druga učna gradiva

Cilji in kompetence:	**Objectives and competences:**
sposobnost celovitega pregleda in oblikovanja tehnoloških procesov v gozdarstvu, sposobnost iskanja vrhunskih rešitev na področju gozdne tehnike in gozdnega dela, spodobnost prepoznavanja in reševanja znanstvenih problemov z uporabo najsodobnejših metod	Ability of comprehensive overview and formation of technological processes in foretsry, ability of searching top solutions on the field of forest techniques and forest work, ability of recognition and solving scientific problems by using state of the art methods

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Poznavanje obstoječih in razvoj novih oblik in vrste tehnologij. Tehnološke povezave, zveze med trajnostnim gospodarjenjem in tehnologijami v gozdarstvu s posebnim poudarkom vpliva na okolje-	Knowledge and understanding: knowledge of different state of the art technologies and development of new ones. Technological connections, connection between sustainable management and technologies in forestry with special emphasis on environment.

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

Študij bo organiziran s predavanji oz. konzultacijami in seminarskim delom.	Study is organized through lectures, consultations and seminar work.

Načini ocenjevanja:	Delež/Weight	Assessment:
Seminar	100,00 %	Seminar work

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Igor Potočnik

1. MARČETA, Dane, PETKOVIĆ, Vladimir, LJUBOJEVIĆ, Darko, POTOČNIK, Igor. Harvesting system suitability as decision support in selection cutting forest management in northwest Bosnia and Herzegovina. *Croatian journal of forest engineering : [journal for theory and application of forestry engineering]*. 2020, vol. 41, iss. 2, str. 251-265, ilustr. ISSN 1845-5719. https://doi.org/10.5552/crojfe.2020.744, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=125634, DOI: 10.5552/crojfe.2020.744. [COBISS.SI-ID 57307395], [JCR, SNIP, Scopus do 24. 8. 2022: št. citatov (TC): 9, čistih citatov (CI): 9, čistih citatov na avtorja (CIAu): 2,25]
2.P OJE, Anton, GRIGOLATO, Stefano, POTOČNIK, Igor. Operator exposure to noise and whole-body vibration in a fully mechanised CTL forest harvesting system in Karst terrain. *Croatian journal of forest engineering : [journal for theory and application of forestry engineering]*. 2019, vol. 40, iss. 1, str. 139-150, ilustr. ISSN 1845-5719. http://www.crojfe.com/site/assets/files/4295/poje.pdf. [COBISS.SI-ID 5381542], [JCR, SNIP, WoS do 4. 12. 2022: št. citatov (TC): 15, čistih citatov (CI): 15, čistih citatov na avtorja (CIAu): 5,00]
3. PETKOVIĆ, Vladimir, POTOČNIK, Igor. Planning forest road network in natural forest areas : a case study in Northern Bosnia and Herzegovina. *Croatian journal of forest engineering : [journal for theory and application of forestry engineering]*. 2018, vol. 39, iss. 1, str. 45-56, ilustr. ISSN 1845-5719. https://hrcak.srce.hr/193550. [COBISS.SI-ID 5259174], [JCR, SNIP, WoS do 5. 1. 2023: št. citatov (TC): 11, čistih citatov (CI): 11, čistih citatov na avtorja (CIAu): 5,50, Scopus do 4. 1. 2023: št. citatov (TC): 12, čistih citatov (CI): 12, čistih citatov na avtorja (CIAu): 6,00]
4. POJE, Anton, POTOČNIK, Igor, MIHELIČ, Matevž. Comparison of electric and petrol chainsaws in terms of efficiency and safety when used in young spruce stands in small-scale private forests. *Small-scale forestry*. Sep. 2018, vol. 17, iss. 3, str. 411-422, tabele, graf. prikazi. ISSN 1873-7617. https://link.springer.com/article/10.1007%2Fs11842-018-9395-4, DOI: 10.1007/s11842-018-9395-4. [COBISS.SI-ID 5071270], [JCR, SNIP, WoS do 3. 1. 2023: št. citatov (TC): 10, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 2,67, Scopus do 28. 11. 2022: št. citatov (TC): 9, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 2,33]
5. POTOČNIK, Igor, POJE, Anton. Forestry ergonomics and occupational safety in high ranking scientific journals from 2005-2016. *Croatian journal of forest engineering : [journal for theory and application of forestry engineering]*. 2017, vol. 38, iss. 1, str. 291-310, ilustr. ISSN 1845-5719. http://www.crojfe.com/r/i/crojfe_38-2_2017/potocnik.pdf. [COBISS.SI-ID 4879526], [JCR, SNIP]
6. SARAŽIN, Jaša, POTOČNIK, Igor, ŠERNEK, Milan. Razpoložljivost virov taninov in ligninov za celostno zamenjavo sintetičnih lepil za les v evropskem prostoru = Tanin and lignin sources availability for the holistic replacement of synthetic wood adhesives in the European area. *Gozdarski vestnik : slovenska strokovna revija za gozdarstvo*. [Tiskana izd.]. feb. 2020, letn. 78, št. 1, str. 23-30, ilustr. ISSN 0017-2723. [COBISS.SI-ID 3174025]

Janez Krč

1. VALATIN, Gregory, ABILDTRUP, Jens, AL-TAWAHA, Abdel Rahman Mohammad Said, ANDREUCCI, Maria-Beatrice, ATANASOVA, Silvia, AVDIBEGOVIĆ, Mersudin, BAKSIC, Nikolina, BANASIK, Kazimierz, BARQUIN, Jose, JAPELJ, Anže, KRČ, Janez, PEZDEVŠEK MALOVRH, Špela, PLANINŠEK, Špela, et al. PESFOR-W : improving the design and environmental effectiveness of woodlands for water payments for ecosystem services. *Research Ideas and Outcomes*. [Spletna izd.]. 2017, vol. 3, 27 str., ilustr. ISSN 2367-7163. https://doi.org/10.3897/rio.3.e13828, DOI: 10.3897/rio.3.e13828. [COBISS.SI-ID 4818086]
2. PEZDEVŠEK MALOVRH, Špela, MIHELIČ, Matevž, KRČ, Janez. Varstvo gozdnih tal z vidika zakonodaje : ali obstajajo omejitve pri rabi sodobnih tehnologij? = Protection of forest soil from the legislation point of view : restrictions for the use of modern technologies. *Acta Silvae et Ligni*. [Tiskana izd.].

2018, [št.] 115, str. 43-56, graf. prikazi. ISSN 2335-3112. http://doi.org/10.20315/ASetL.115.4, http://dirros.openscience.si/IzpisGradiva.php?id=9191, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=121833, DOI: 10.20315/ASetL.115.4. [COBISS.SI-ID 5157030]

3. ARNIČ, Domen (avtor, fotograf), KRČ, Janez, DIACI, Jurij (avtor, fotograf). Primerjava izbiralnega redčenja in situacijskega redčenja v bukovih letvenjakih na Menini = Comparison of selective thinning and crop tree situational thinning in young beech stands on Menina. *Gozdarski vestnik : slovenska strokovna revija za gozdarstvo*. [Tiskana izd.]. mar. 2018, letn. 76, št. 2, str. 72-82, ilustr., zvd., graf. prikazi. ISSN 0017-2723. http://dirros.openscience.si/IzpisGradiva.php?id=8181. [COBISS.SI-ID 5010854]

4. KAJANUS, Miika, LEBAN, Vasja, GLAVONJIĆ, Predrag, KRČ, Janez, NEDELJKOVIĆ, Jelena, NONIĆ, Dragan, NYBAKK, Erlend, POSAVEC, Stjepan, RIEDL, Marcel, TEDER, Meelis, et al. What can we learn from business models in the European forest sector : exploring the key elements of new business model designs. *Forest Policy and Economics : a companion journal to Forest Ecology and Management*. [Print ed.]. Feb. 2019, vol. 99, str. 145-156, ilustr., graf. prikazi. ISSN 1389-9341. https://doi.org/10.1016/j.forpol.2018.04.005, DOI: 10.1016/j.forpol.2018.04.005. [COBISS.SI-ID 5080998]

5. POJE, Anton, MIHELIČ, Matevž, KRČ, Janez, LEBAN, Vasja. Usklajena merila sprejemljive poškodovanosti gozdnih tal - preverjanje ustreznosti med gozdarskimi strokovnjaki = Harmonised criteria for acceptable forest soil damage - verifying suitability among forestry professionals. *Acta Silvae et Ligni*. [Tiskana izd.]. 2021, [št.] 124, str. 43-54, ilustr. ISSN 2335-3112. https://doi.org/10.20315/ASetL.124.4, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=125591, http://dirros.openscience.si/IzpisGradiva.php?id=13800, DOI: 10.20315/ASetL.124.4. [COBISS.SI-ID 57405187]

6. ARNIČ, Domen, KRČ, Janez, DIACI, Jurij. Modeling of time consumption for selective and situational precommercial thinning in mountain beech forest stands. *IForest*. 2021, vol. 14, iss. 2, str. 137-143, ilustr. ISSN 1971-7458. https://doi.org/10.3832/ifor3556-014, http://dirros.openscience.si/IzpisGradiva.php?id=13781, https://iforest.sisef.org/abstract/?id=ifor3556-014, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=125538, DOI: 10.3832/ifor3556-014. [COBISS.SI-ID 55847171]

7. KRČ, Janez. Strojna sečnja kot dejavnik vpliva na gozdna tla in uspešnost obnove gozdnih sestojev = Mechanized logging as a factor of impact on the forest soil and successfulness of forest stand regeneration. *Gozdarski vestnik : slovenska strokovna revija za gozdarstvo*. [Tiskana izd.]. maj 2017, letn. 75, št. 4, str. 218-223, ilustr. ISSN 0017-2723. http://dirros.openscience.si/IzpisGradiva.php?id=6354. [COBISS.SI-ID 4773542]

HORTIKULTURA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Hortikultura
Course title:	Horticulture
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037303
Koda učne enote na članici/UL Member course code:	3805

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	30	0	0	10	190	10

Nosilec predmeta/Lecturer:	Franc Štampar

Izvajalci predavanj:	Metka Hudina, Ana Slatnar, Franc Štampar, Robert Veberič
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Vključijo se lahko vsi, ki so uspešno končali MSc programe s področja ved o živi naravi (Life Sciences) ali univerzitetne programe z istega področja	Students who have successfully completed the MSc programs in the field of Life Sciences or university programs of the same field.

Vsebina:	Content (Syllabus outline):
Predstavljena bo hortikultura kot najbolj rastoča kmetijska panoga - strategija razvoja v 21. stoletju v Evropi in izven Evrope z vidika kakovosti obstoječih in novih hortikulturnih proizvodov ter ustvarjenja prijetnejših bivalnih pogojev. Podan bo pomen juvenilnosti za uspešno razmnoževanje hortikulturnih rastlin. Pri vrtnarstvu bo predstavljen pomen in	Horticulture is the fastest growing field within agriculture. The strategy of its development in the 21st Century in Europe and broader will be presented in terms of quality of existing and new horticultural products and from the view of creating pleasant living conditions. The importance of juvenility for successful propagation of horticultural plants will be

tehnologija pridelave funkcionalne zelenjave. Terroir vinske trte predstavlja kompleksen pristop k pridelavi kakovostnega grozdja in vrhunskega vina. Poznavanje in razumevanje arhitekture drevesa predstavlja naravni razvoj in je osnova za uvedbo novih rešitev pri gojitvenih oblikah, kar posledično pomeni večji izkoristek naravnih danosti in ostalih materialov, ki jih vložimo v pridelavo. Uporaba fitofarmacevtskih sredstev pri pridelavi hortikulturnih rastlin je vedno bolj nadzorovana in tudi limitirana. Posebej bo predstavljena problematika ostankov FFS v hortikulturnih proizvodih ter nova tehnologija pridelava hortikulturnih rastlin po principu "Zero residual level" pri sadnih vrstah, zelenjavi in vinski trti.	discussed and production technology of functional vegetables will be explained. Grapevine terroir denotes a complex approach to the production of quality grapes and wine and therefore the students will be equipped with knowledge on the subject. Understanding of the tree architecture represents the basis for the introduction of new solutions in training systems resulting in optimal use of natural resources and other materials important for successful production. The use of plant protection products in the cultivation of horticultural crops is increasingly controlled and limited. Therefore, the problem of pesticide residues in horticultural products will be stressed and new technological measures striving towards 'Zero residual level' in fruit, vegetables and grapevine will be presented.

Temeljna literatura in viri/Readings:

Alastair A. 2012. Harvesting the sun: a profile of World horticulture: fruit, vegetables, flowers, and ornamental garden plants supporting life, providing food, bringing health and wealth, and creating a beautiful planet. Leuven : ISHS secreatriat, 72 str. ISBN 978-90-6605-704-3
Adams, C.R. ; Early, M.P. 2012. Principles of horticulture. Elsevier, 390 str. **ISBN** - 978-0-08096-957-2
Revijalni članki s področja, tekoča periodika, druga učna gradiva …
Articles from scientific journals, current magazines, other readings …

Cilji in kompetence:	**Objectives and competences:**
Temeljni cilji predmeta Hortikultura je povezava različnih disciplin z namenom izdelav optimalnih tehnologij pridelave hortikulturnih rastlin za potrebe visokokakovostne varne hrane in ohranjanje človekovega bivalnega okolja.	The basic objective of the course is the understanding of a multidisciplinary approach in order to develop optimal technologies for the production of high-quality horticultural plants and simultaneous preservation of living environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Sposobnost analize hortikulturnih problemov, sinteze znanja in informacij ter predvidevanje potencialnih rešitev, njihove izvedbe ter posledic.	Knowledge and understanding: Ability to analyze horticultural problems, synthesize information and to develop potential solutions, implement them in practice and understand their impact.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, izdelava ciljnih seminarskih nalog, ki so vezane na rešitev določenih problemov in hkrati predstavljajo sintezo znanja in informacij.	Lectures and seminars directed at developing solutions to specific problems with a synthesis of knowledge and information.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar, zagovor seminarja	100,00 %	Seminar and its public presentation.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

prof. dr. Franci ŠTAMPAR

1. JUHART, Jan, MEDIČ, Aljaž, VEBERIČ, Robert, HUDINA, Metka, JAKOPIČ, Jerneja, ŠTAMPAR, Franci. Phytochemical composition of red-fleshed apple cultivar 'Baya Marisa' compared to traditional, white-fleshed apple cultivar 'Golden Delicious'. *Horticulturae*. 2022, vol. 8, iss. 9, art. 811, 16 str., ilustr. ISSN 2311-7524. https://www.mdpi.com/2311-7524/8/9/811, DOI: 10.3390/horticulturae8090811. [COBISS.SI-ID 120565763],
2. TOMIĆ, Jelena, GLIŠIĆ, Ivana, MILOŠEVIĆ, Nebojša, ŠTAMPAR, Franci, MIKULIČ PETKOVŠEK, Maja, JAKOPIČ, Jerneja. Determination of fruit chemical contents of two plum cultivars grafted on four rootstocks. *Journal of food composition and analysis*. 2022, art. no. 103944, vol. 105, str. 1-9, ilustr. ISSN 0889-1575. DOI: 10.1016/j.jfca.2021.103944. [COBISS.SI-ID 67196419],
3. SOLAR, Anita, MEDIČ, Aljaž, SLATNAR, Ana, MIKULIČ PETKOVŠEK, Maja, BOTTA, Roberto, ROVIRA, Merce, SARRAQUIGNE, Jean-Paul, SILVA, Ana Paula, VEBERIČ, Robert, ŠTAMPAR, Franci, HUDINA, Metka, BACCHETTA, Loretta. The effects of the cultivar and environment on the phenolic contents of hazelnut kernels. *Plants*. 2022, vol. 11, iss. 22, 3051, str. 1-15, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/11/22/3051, DOI: 10.3390/plants11223051. [COBISS.SI-ID 129602307],
4. SCHMITZER, Valentina, ŠENICA, Mateja, SLATNAR, Ana, ŠTAMPAR, Franci, JAKOPIČ, Jerneja. Changes in metabolite patterns during refrigerated storage of lamb's lettuce (Valerianella locusta L. Betcke). *Frontiers in nutrition*. Okt. 2021, vol. 8, art. 731869, str. 1-10, ilustr. ISSN 2296-861X. https://www.frontiersin.org/articles/10.3389/fnut.2021.731869/full, DOI: 10.3389/fnut.2021.731869. [COBISS.SI-ID 85888003],
5. ZAMLJEN, Tilen, MEDIČ, Aljaž, VEBERIČ, Robert, HUDINA, Metka, ŠTAMPAR, Franci, SLATNAR, Ana. Apple fruit (Malus domestica Borkh.) metabolic response to infestation by invasive brown marmorated stink bug (Halyomorpha halys Stal.). *Horticulturae*. 2021, vol. 7, no. 8 (212), str. 1-7. ISSN 2311-7524. https://www.mdpi.com/2311-7524/7/8/212, DOI: 10.3390/horticulturae7080212. [COBISS.SI-ID 72388099],
6. JAKOPIČ, Jerneja, SCHMITZER, Valentina, VEBERIČ, Robert, SMRKE, Tina, ŠTAMPAR, Franci. Metabolic response of 'Topaz' apple fruit to minimal application of nitrogen during cell enlargement stage. *Horticulturae*. 2021, vol. 7, no. 9 (266), str. 1-10. ISSN 2311-7524. https://www.mdpi.com/2311-7524/7/9/266, DOI: 10.3390/horticulturae7090266. [COBISS.SI-ID 77559811],
7. CVELBAR WEBER, Nika, RAZINGER, Jaka, JAKOPIČ, Jerneja, SCHMITZER, Valentina, HUDINA, Metka, SLATNAR, Ana, VEBERIČ, Robert, ŠTAMPAR, Franci, ZAMLJEN, Tilen. Brown marmorated stink bug (Halyomorpha halys Stål.) attack induces a metabolic response in strawberry (Fragaria × ananassa Duch.) fruit. *Horticulturae*. 2021, vol. 7, iss. 12, str. 1-9, ilustr. ISSN 2311-7524. https://www.mdpi.com/2311-7524/7/12/561, DOI: 10.3390/horticulturae7120561. [COBISS.SI-ID 88464131],
8. SCHMITZER, Valentina, ŠIRCELJ, Helena, ŠTAMPAR, Franci, SLATNAR, Ana. Physico-chemical characterization of Cornus kousa Burg. fruite : determining optimal maturity for fresh consumption. *Journal of the science of food and agriculture*. [Print ed.]. 2021, vol. 101, iss. 2, str. 778-785. ISSN 0022-5142. DOI: 10.1002/jsfa.10689. [COBISS.SI-ID 29613315],
9. SLATNAR, Ana, MIKULIČ PETKOVŠEK, Maja, ŠTAMPAR, Franci, VEBERIČ, Robert, KACJAN-MARŠIĆ, Nina. Influence of cluster thinning on quantitative and qualitative parameters of cherry tomato. *European journal of horticultural science*. 2020, vol. 85, no. 1, str. 30-41. ISSN 1611-4426. DOI: 10.17660/eJHS.2020/85.1.4. [COBISS.SI-ID 43771651],
10. SOLAR, Anita, ŠTAMPAR, Franci, VEBERIČ, Robert, TRDAN, Stanislav. How much walnut husk fly (Rhagoletis completa Cresson) affects nut quality of different walnut cultivars?. *European journal of horticultural science*. 2020, vol. 85, no. 1, str. 63-74. ISSN 1611-4426. DOI: 10.17660/eJHS.2020/85.1.7. [COBISS.SI-ID 9446777],

prof. dr. Robert VEBERIČ

1. ČEBULJ, Anka, MIKULIČ PETKOVŠEK, Maja, VEBERIČ, Robert, JAKOPIČ, Jerneja. Effect of spring frost damage on apple fruit (Malus domestica Borkh.) inner quality at harvest. *Agriculture*. 2022, vol. 12, iss. 1, str. 1-10, ilustr. ISSN 2077-0472. https://www.mdpi.com/2077-0472/12/1/14, DOI: 10.3390/agriculture12010014. [COBISS.SI-ID 90849283],
2. ZAMLJEN, Tilen, SLATNAR, Ana, HUDINA, Metka, VEBERIČ, Robert, MEDIČ, Aljaž. Characterization and quantification of capsaicinoids and phenolic compounds in two types of chili olive oils, using HPLC/MS. *Foods*. 2022, vol. 11, iss. 15, art. 2256, 9 str., ilustr. ISSN 2304-8158. https://www.mdpi.com/2304-8158/11/15/2256, DOI: 10.3390/foods11152256. [COBISS.SI-ID 120174851],
3. MEDIČ, Aljaž, ZAMLJEN, Tilen, GROHAR, Mariana Cecilia, SLATNAR, Ana, HUDINA, Metka, VEBERIČ, Robert. Using HPLC–MS/MS to assess the quality of beet, mizuna, lettuce and corn salad after

juglone and walnut leaf extract treatments. *Agronomy*. 2022, vol. 12, iss. 2, str. 1-17 (347), ilustr. ISSN 2073-4395. https://www.mdpi.com/2073-4395/12/2/347/htm, DOI: 10.3390/agronomy12020347. [COBISS.SI-ID 95552003],
4. SMRKE, Tina, VEBERIČ, Robert, HUDINA, Metka, ŽITKO, Vid, FERLAN, Mitja, JAKOPIČ, Jerneja. Fruit quality and yield of three highbush blueberry (Vaccinium corymbosum L.) cultivars grown in two planting systems under different protected environments. *Horticulturae*. 2021, vol. 7, iss. 12, str. 1-22 (591), ilustr. ISSN 2311-7524. https://www.mdpi.com/2311-7524/7/12/591/. [COBISS.SI-ID 90290947],
5. ZAMLJEN, Tilen, HUDINA, Metka, VEBERIČ, Robert, SLATNAR, Ana. Biostimulative effect of amino acids and green algae extract on capsaicinoid and other metabolite contents in fruits of Capsicum spp. Chemical and biological technologies in agriculture. 2021, vol. 8, art. no. 63, str. 1-12. ISSN 2196-5641. DOI: 10.1186/s40538-021-00260-5. [COBISS.SI-ID 84493571],
6. MEDIČ, Aljaž, SOLAR, Anita, HUDINA, Metka, VEBERIČ, Robert. Phenolic response to walnut anthracnose (Ophiognomonia leptostyla) infection in different parts of Juglans regia husks, using HPLC-MS/MS. *Agriculture*. 2021, vol. 11, no. 7 (659), str. 1-12. ISSN 2077-0472. https://www.mdpi.com/2077-0472/11/7/659, DOI: 10.3390/agriculture11070659. [COBISS.SI-ID 70187523],

izr. prof. Ana SLATNAR

1. ZAMLJEN, Tilen, MEDIČ, Aljaž, HUDINA, Metka, VEBERIČ, Robert, SLATNAR, Ana. Biostimulative effect of amino acids on the enzymatic and metabolic response of two Capsicum annuum L. cultivars grown under salt stress. *Scientia horticulturae*. [Print ed.]. 2023, vol. 309, art. 111713, 6 str. ISSN 0304-4238. https://www.sciencedirect.com/science/article/pii/S0304423822008238, DOI: 10.1016/j.scienta.2022.111713. [COBISS.SI-ID 130931203],
2. ZAMLJEN, Tilen, MEDIČ, Aljaž, VEBERIČ, Robert, HUDINA, Metka, JAKOPIČ, Jerneja, SLATNAR, Ana. Metabolic variation among fruits of different chili cultivars (Capsicum spp.) using HPLC/MS. *Plants*. 2022, vol. 11, iss. 1, str. 1-14, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/11/1/101, DOI: 10.3390/plants11010101. [COBISS.SI-ID 91911171],
3. ZAMLJEN, Tilen, MEDIČ, Aljaž, HUDINA, Metka, VEBERIČ, Robert, SLATNAR, Ana. Biostimulatory effects of amino acids on phenylalanine ammonia lyase, capsaicin synthase and peroxidase activities in Capsicum baccatum L. *Biology*. 2022, vol. 11, iss. 5 (674), 11 str., ilustr. ISSN 2079-7737. https://www.mdpi.com/2079-7737/11/5/674, DOI: 10.3390/ biology11050674. [COBISS.SI-ID 106540035],
4. ZAMLJEN, Tilen, MEDIČ, Aljaž, HUDINA, Metka, VEBERIČ, Robert, SLATNAR, Ana. Salt stress differentially affects the primary and secondary metabolism of peppers (Capsicum annuum L.) according to the genotype, fruit part, and salinity level. *Plants*. 2022, vol. 11, no. 7 (853), 18 str., ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/11/7/853, DOI: 10.3390/ plants11070853. [COBISS.SI-ID 102098435],
5. SLATNAR, Ana, MIKULIČ PETKOVŠEK, Maja, ŠTAMPAR, Franci, VEBERIČ, Robert, KACJAN-MARŠIĆ, Nina. Influence of cluster thinning on quantitative and qualitative parameters of cherry tomato. *European journal of horticultural science*. 2020, vol. 85, no. 1, str. 30-41. ISSN 1611-4426. DOI: 10.17660/eJHS.2020/85.1.4. [COBISS.SI-ID 43771651],
6. SLATNAR, Ana, MIKULIČ PETKOVŠEK, Maja, ŠTAMPAR, Franci, VEBERIČ, Robert, HORVAT, Jasmina, JAKŠE, Marijana, ŠIRCELJ, Helena. Game of tones: sugars, organic acids, and phenolics in green and purple asparagus (Asparagus officinalis L.) cultivars. *Turkish journal of agriculture and forestry*. [Tiskana izdaja]. 2018, vol. 42, no. 1, str. 55-66. ISSN 1300-011X. DOI: 10.3906/tar-1707-44. [COBISS.SI-ID 8844921],

prof. dr. Metka HUDINA

1. KUNC, Nina, HUDINA, Metka, MIKULIČ PETKOVŠEK, Maja, BAVCON, Jože, RAVNJAK, Blanka, OSTERC, Gregor. Detailed metabolic characterization of flowers and hips of Rosa gallica L. grown in open nature. Plants. 2023, vol. 12, iss. 16, [art.] 2979, 16 str., ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/12/16/2979, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=148796, DOI: 10.3390/plants12162979. [COBISS.SI-ID 162849795],
2. SMRKE, Tina, ŠTAJNER, Nataša, CESAR, Tjaša, VEBERIČ, Robert, HUDINA, Metka, JAKOPIČ, Jerneja. Correlation between destructive and non-destructive measurements of highbush blueberry (Vaccinium corymbosum L.) fruit during maturation. Horticulturae. 2023, vol. 9, iss. 4, art. 501, 14 str., ilustr. ISSN 2311-7524. https://www.mdpi.com/2311-7524/9/4/501, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=145623. [COBISS.SI-ID 150548483],
3. KUNC, Nina, HUDINA, Metka, OSTERC, Gregor, BAVCON, Jože, RAVNJAK, Blanka, MIKULIČ PETKOVŠEK, Maja. Phenolic compounds of rose hips of some rosa species and their hybrids native grown in the south-west of Slovenia during a two-year period (2020–2021). Foods. 2023, vol. 12, iss. 10, art. 1952, 18 str., ilustr. ISSN 2304-8158. https://www.mdpi.com/2304-8158/12/10/1952, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=145815. [COBISS.SI-ID 152293123],

4. JUHART, Jan, MEDIČ, Aljaž, JAKOPIČ, Jerneja, VEBERIČ, Robert, HUDINA, Metka, ŠTAMPAR, Franci. Use of HPLC-MS to determine the loss of metabolites in apple juices under different storage conditions. Foods. 2023, vol. 12, iss. 15, art. 2822, 16 str., ilustr. ISSN 2304-8158. https://www.mdpi.com/2304-8158/12/15/2822, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=148251. [COBISS.SI-ID 160747011],
5. IVANČIČ, Tea, JAKOPIČ, Jerneja, VEBERIČ, Robert, VESEL, Viljanka, HUDINA, Metka. Effect of ripening on the phenolic and sugar contents in the meso- and epicarp of olive fruits (Olea europaea L.) cultivar 'Leccino'. *Agriculture*. 2022, vol. 12, iss. 9, art. 1347, 17 str. ISSN 2077-0472. https://www.mdpi.com/2077-0472/12/9/1347, DOI: 10.3390/agriculture12091347. [COBISS.SI-ID 122259971]
6. DRKENDA, Pakeza, ĆULAH, Asmira, SPAHO, Nermina, AKAGIĆ, Asima, HUDINA, Metka. How do consumers perceive sensory attributes of apple?. *Foods*. 2021, vol. 10, iss. 11, str. 1-12 (2667), ilustr. ISSN 2304-8158. https://www.mdpi.com/2304-8158/10/11/2667, DOI: 10.3390/foods10112667. [COBISS.SI-ID 83197955]

IMUNOLOŠKI POSKUSI IN TEHNIKE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Imunološki poskusi in tehnike
Course title:	Immunological experiments and techniques
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0037285

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
	0	25	0	0	100	5

Nosilec predmeta/Lecturer:	Mojca Narat
Izvajalci predavanj:	Mojca Narat
Izvajalci seminarjev:	
Izvajalci vaj:	Mojca Narat
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	individualno raziskovalni /individual research

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
splošni pogoji za vpis na doktorski študij	General prerequisites for enrolment into doctoral studies

Vsebina:	Content (Syllabus outline):
Načrtovanje imunoloških poskusov. Pregled imunoloških metod in tehnik ter izbor tistih, s katerimi se bo kandidat srečeval pri izvedbi doktorskega dela. Pri izvedbi laboratorijskega dela kandidat lahko uporabi svoj material in izvede del doktorske naloge. Možnosti:Pridobivanje poliklonalnih-monoklonalnih-rekombinantnih protiteles. Fagna knjižnica. Konjugiranje protiteles in uporaba za detekcijo/izolacijo/aplikacijo. Izolacija in	Planning of immunological experiments. Overview of immunological methods and techniques and the selection of those that candidate encountered in the implementation of the doctoral dissertation. The candidate can use its own material. Options: Production of monoclonal-polyclonal-recombinant antibodies. Phage display. Conjugation of antibodies and their use for detection / isolation / application. Isolation and detection of antigens: DIBA, Westrn-

detekcija antigenov: DIBA, Westrn-blott, ELISA, imunoprecipitacija. Spremljanje imunskega odziva na nivoju molekul (protiteles, citokinov) in izražanja genov. Kompleksni poskusi z uporabo cDNA mikromrež in fenotipskih mikromrež. Celični modeli za proučevanje učinkov antigenov.	blott, ELISA, immunoprecipitation. Monitoring of immune response at the level of molecules (antibodies, cytokines) and gene expression. Complex experiments using cDNA microarray and phenotypic microarrays. Cell models to study the effects of antigens.

Temeljna literatura in viri/Readings:

Van Oss Carl J, Van Regenmortel Marc H.V. 1994. Immunochemistry. New York, Marcel Dekker
Benny K.C.Lo. 2004. Antibody Engineering: Methods and Protocols. 1st ed. New Yersey, Humana Press.
Dodatna literature: Tekoča znanstvena periodika, izbrana individualno glede na vsebino dela kandidatov

Cilji in kompetence:	**Objectives and competences:**
Na konkretnem primeru si kandidat sestavi protokol za eksperiment in pridobi kompetence načrtovanja, izvedbe, vrednotenja in prikazovanja rezultatov.	Candidate will design the protocol for experiment and acquire skills of planning, implementation, evaluation and presentation of results.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje kompleksnosti imunoloških študij. Sposobnost načrtovanja imunoloških poskusov. Konkretna izkušnja dela v imunološkem laboratoriju. Rezultat, ki je del doktorske naloge.	Knowledge and understanding: Understanding the complexity of immunological studies. Ability to design immunological experiments. Practical experience of work in the immunological laboratory. The result, which is part of the doctoral thesis.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Praktično delo v laboratoriju, vodeno s strani mentorice (nosilka predmeta) in konzultacije.	Practical work in the laboratory, supervised by the lecturer and consultations.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Predstavitev rezultatov –preverjanje razumevanja	100,00 %	Presentation of results- verification of understanding

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Mojca Narat:

1.KNEZ, Špela, **NARAT, Mojca**, OGOREVC, Jernej. Differential gene expression induced by different TLR agonists in A549 lung epithelial cells is modulated by CRISPR activation of TLR10. *Biomolecules*. 2023, no. 1, art. 19, str. 1-15, ilustr. ISSN 2218-273X. https://www.mdpi.com/2218-273X/13/1/19, DOI: 10.3390/biom13010019. [COBISS.SI-ID 135026947]

2.LEVANIČ, Jaka, POLJANŠEK, Ida, VEK, Viljem, **NARAT, Mojca**, OVEN, Primož. Chlorhexidine digluconate uptake and release from alkane-crosslinked nanocellulose hydrogels and subsequent antimicrobial effect. *Bioresources*. 2020, vol. 15, iss. 2, str. 3458-3472, ilustr. ISSN 1930-2126. https://bioresources.cnr.ncsu.edu/wp-content/uploads/2020/03/BioRes_15_2_3458_Levanic_PVO_Chlorhex_Digluconat_Uptake_Nanocellulos_Hydrogels_Antimicrob_Effect_16362.pdf. [COBISS.SI-ID 3202441]

3.NOVAK, Maruša, ČEPIN, Urška, HODNIK, Vesna, **NARAT, Mojca**, JAMNIK, Maja, KRAŠEVEC, Nada, SEPČIĆ, Kristina, ANDERLUH, Gregor. Functional studies of aegerolysin and MACPF-like proteins in Aspergillus niger. *Molecular microbiology*. Oct. 2019, vol. 112, iss. 4, str. 1253-1269. ISSN 0950-382X. https://onlinelibrary.wiley.com/doi/full/10.1111/mmi.14360, DOI: 10.1111/mmi.14360. [COBISS.SI-ID 4280456]

4.TESOVNIK, Tanja, CIZELJ, Ivanka, ZORC, Minja, ČITAR, Manuela, BOŽIČ, Janko, GLAVAN, Gordana, **NARAT, Mojca**. Immune related gene expression in worker honey bee (Apis mellifera carnica) pupae exposed to neonicotinoid thiamethoxam and Varroa mites (Varroa destructor). *PloS one*. 2017, vol. 12, no. 10, str. 1-15, e0187079, ilustr. ISSN 1932-6203. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0187079, DOI: 10.1371/journal.pone.0187079. [COBISS.SI-ID 3986312]

5.TESOVNIK, Tanja, ZORC, Minja, GREGORC, Aleš, RINEHART, Timothy, ADAMCZYK, John, **NARAT, Mojca**. Immune gene expression in developing honey bees (Apis mellifera L.) simultaneously exposed to imidacloprid and Varroa destructor in laboratory conditions. *Journal of Apicultural Research*. 2019, vol. 58, no. 5, str. 730-739, ilustr. ISSN 0021-8839. https://www.tandfonline.com/doi/pdf/10.1080/00218839.2019.1634463?needAccess=true, DOI: 10.1080/00218839.2019.1634463. [COBISS.SI-ID 4261000]

INDIVIDUALNO RAZISKOVALNO DELO - 1. LETNIK

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Individualno raziskovalno delo - 1. letnik
Course title:	
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	1. letnik	Celoletni	obvezni

Univerzitetna koda predmeta/University course code:	0040212
Koda učne enote na članici/UL Member course code:	0013

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
				750		30

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references:

INDIVIDUALNO RAZISKOVALNO DELO - 2. LETNIK

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Individualno raziskovalno delo - 2. letnik
Course title:	Individual Research Work for 2nd year
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	2. letnik	Celoletni	obvezni

Univerzitetna koda predmeta/University course code:	0037370
Koda učne enote na članici/UL Member course code:	3301

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	1000	0	40

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	obvezni

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

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references:

INDIVIDUALNO RAZISKOVALNO DELO - 3. LETNIK

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Individualno raziskovalno delo - 3. letnik
Course title:	Individual research work for 3dr year
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	3. letnik	Celoletni	obvezni

Univerzitetna koda predmeta/University course code:	0138413
Koda učne enote na članici/UL Member course code:	2739

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	1500	0	60

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	obvezni

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

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references:

INDIVIDUALNO RAZISKOVALNO DELO - 4. LETNIK

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Individualno raziskovalno delo - 4. letnik
Course title:	Individaul research work for 4th year
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	4. letnik	Celoletni	obvezni

Univerzitetna koda predmeta/University course code:	0139010
Koda učne enote na članici/UL Member course code:	0

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	1250	0	50

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references:

INOVACIJE V RAZISKAVAH

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Inovacije v raziskavah
Course title:	Innovations in research
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0644524

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	15	80	5

Nosilec predmeta/Lecturer: Ita Junkar

Izvajalci predavanj:	Ita Junkar
Izvajalci seminarjev:	Ita Junkar
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type: teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	Basic preconditions for doctoral studies.

Vsebina:	Content (Syllabus outline):
Ta predmet na doktorskem študiju zagotavlja interdisciplinarno znanje, potrebno za raziskovanje in razvoj ustvarjalnih idej v tržno zanimive inovacije z integracijo znanstvenih načel, tehnološkega napredka, interdisciplinarnega dela in strategij komercializacije. Poudarja razvoj idej in inovacij ter sistematični razvoj za ustvarjanje produktov/tehnologij v realnih sistemih. Študenti se bodo vključili v skupinske projekte, ki temeljijo na timskem delu, in izkoriščali različne perspektive za spodbujanje inovacij ter	This doctoral-level course provides interdisciplinary knowledge necessary to explore the process of transforming creative ideas into market-ready innovations by integrating scientific principles, technological advancements, interdisciplinary work and commercialization strategies. It emphasizes the art of ideation and innovation with the science of systematic development, to create value in real-world applications. Students will engage in team-based projects, leveraging diverse perspectives to foster

pospešitev komercializacije prebojnih idej. Program študente pripravlja na sodelovanje v raziskavah, razvoju, tržno usmerjenih inovacijah, prenosu tehnologij in podjetništvu. Predmet bo spodbujal tudi sodelovanje z gospodarstvom in omogočal delo na konkretnih izzivih v podjetjih. - Načela ustvarjanja idej in kreativnega reševanja problemov - Znanost o sodelovanju: sestava in vodenje uspešnih timov - Metode ocene in izboljšanje idej v izvedljive produkte ali storitve - Prenos znanosti in prototipiranje tehnologij - Razvijanje strategij za analizo trga, zaščito intelektualne lastnine in prenos tehnologij - Ustvarjanje komercializacijskih road-mapov za inovativne projekte - Poslovni model za znanstvene inovacije - Priprava učinkovite predstavitve (pitch) za specifično občinstvo	innovation and accelerate the commercialization of ground-breaking ideas. The program prepares students to lead collaborative efforts in research, development, market-driven innovation, technology transfer, and entrepreneurship. The subject will also promote collaboration with industry and stimulate work on real research matters in companies. - principles of idea creation and creative problem solving - the science of teamwork: building and leading successful teams - methods to evaluate and refine ideas into feasible products or services - translational science and technology prototyping - develop strategies for market analysis, intellectual property protection, and technology transfer - create commercialization roadmaps for innovative projects - business model for scientific innovation - preparing effective pitch for specific audience

Temeljna literatura in viri/Readings:

Temeljna literature/ Basic literature

- Chesbrough, H. (2020). Open Innovation Results: Going Beyond the Hype and Getting Down to Business. Oxford University Press.
- Kelley, T., & Kelley, D. (2013). Creative Confidence: Unleashing the Creative Potential Within Us All. Crown Business.
- Sinek, S. (2009). Start with Why: How Great Leaders Inspire Everyone to Take Action. Portfolio

Priporočena literature/ Suggested literature

- Rowe, P. G. (2013). Design Thinking: Understand – Improve – Apply. Berg Publishers.
- Brown, T., & Wyatt, J. (2019). Change by Design: How Design Thinking Creates New Alternatives for Business and Society. HarperBusiness.
- Govindarajan, V., & Trimble, C. (2020). The Three Box Solution: A Strategy for Leading Innovation. Harvard Business Review Press.

Revije/ Journals

European Journal of Innovation Management (EJIM), Technovation, Business Horizons, Journal of Technology Transfer

Cilji in kompetence:	**Objectives and competences:**
Cilj: - Opremiti študente s teoretičnim in praktičnim razumevanjem celotnega procesa inovacij—od ustvarjanja idej do komercializacije - Spodbujati sposobnost sestave, vodenja in dela v interdisciplinarnih timih ter jih pripraviti za učinkovito upravljanje in sodelovanje pri inovativnih projektih - Omogočiti študentom, da ocenijo potrebe trga, analizirajo priložnosti in ustvarijo strategije za komercializacijo inovativnih tehnologij in rešitev - Oblikovanje trajnostnih poslovnih modelov za znanstvene inovacije, vključno z upravljanjem intelektualne lastnine in prenosom tehnologij	Objectives: - Equip students with the theoretical and practical understanding of the entire innovation process—from ideation through to commercialization - Foster the ability to build, lead, and work in interdisciplinary teams, preparing students to manage and collaborate on innovative projects effectively - Enable students to evaluate market needs, analyse opportunities, and create strategies for the commercialization of innovative technologies and solutions - Designing sustainable business models for scientific innovations including managing intellectual property and technology transfer

- Razviti sposobnosti in znanja za jasno in prepričljivo predstavitev svoje ideje, rešitve in strategije komercializacije različnim deležnikom Kompetence: - Interdisciplinarno strokovno znanje - Ustvarjalno razmišljanje in sposobnosti reševanja problemov - Raziskave in inovacije - Komunikacijske sposobnosti - Sposobnost oblikovanja in vodenja visoko učinkovitih timov v raziskovalnih in inovacijskih projektih - Spretnosti uporabe strukturiranih metodologij (kot so design thinking, poslovni model canvas) za ocenjevanje, prototipiranje in izpopolnjevanje idej v tržno pripravne izdelke ali storitve - Kompetence pri razumevanju in uporabi prototipnih tehnik na različnih področjih - Sposobnost ustvarjanja in izvedbe prepričljivih predstavitev	- Develop ability and knowledge to clearly and persuasively present their ideas, solutions, and commercialization strategies to different stakeholders Competencies: - Interdisciplinary expertise - Creative thinking and problem-solving skills - Communication skills - Ability to build and guide high-performing teams in research and innovation projects - Skills in using structured methodologies (such as design thinking, business model canvas) to evaluate, prototype, and refine ideas into market-ready products or services - Competence in understanding and applying prototyping techniques in various fields - Ability to create and deliver compelling pitches

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: - Sposobnost presoje in izboljšave inovativnih idej ter njihovo preoblikovanje v izvedljive in tržno zanimive produkte ali storitve - Sposobnost pretvorbe znanstvenih raziskav in tehnoloških inovacij v funkcionalne prototipe, pripravljene za testiranje in tržno uporabo - Sposobnost ustvarjanja in izvajanja osnovnih strategij za analizo trga, zaščito intelektualne lastnine in znanja z upravljanjem procesov prenosa tehnologij - Oblikovanje poslovnih modelov za znanstvene inovacije, ki se navezujejo na potrebe trga in finančne cilje - Priprava in izvedba prepričljivih predstavitev, prilagojenih tipu občinstva s katerimi jasno prikažejo vrednost in potencial njihovih inovacij	*Knowledge and Understanding:* - Ability to evaluate and refine innovative ideas, transforming them into viable and market-ready products or services - Skills to convert scientific research and technological innovations into functional prototypes ready for testing and market application - Skills to create and implement strategies for conducting market analysis, protecting intellectual property, and managing technology transfer processes - Design of business models for scientific innovations, aligning financial and market goals - Prepare and deliver persuasive pitches tailored to different audiences, clearly communicating the value and potential of their innovations

Metode poučevanja in učenja:	**Learning and teaching methods:**
Interactive work, team work. Introduction to the subject in the form of short lectures.	Interaktivno delo, timsko delo. Predstavitev predmeta v obliki kratkih predavanj.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ustna predsatvitev tematike raziskav posameznega študenta.	60,00 %	Oral presentation of student's research work.
Seminarska naloga	40,00 %	Seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

- JUNKAR, Ita, ZAPLOTNIK, Rok, BENČINA, Metka, MOZETIČ, Miran. Method for treatment medical devices made from nickel - titanium (NiTi) alloys : European patent specification EP 3 636 294 B1, 2021-11-17, Munich: European Patent Office, 2021.
- JUNKAR, Ita, BENČINA, Metka, ZAPLOTNIK, Rok, MOZETIČ, Miran, SODIN-ŠEMRL, Snežna, LAKOTA, Katja, IGLIČ, Aleš. Method for treatment of medical metals and their alloys EP4049690 B1, 2024-08-14. München: European Patent Office, 2024.
- RENER-SITAR, Ksenija, JUNKAR, Ita, CVELBAR, Uroš, MOZETIČ, Miran. Metoda za izboljšanje vezave dentalne silikatne keramike s kompozitnimi cementi : patent SI 26082 A, 2022-04-29. Ljubljana: Urad RS za intelektualno lastnino, 2022.
- JUNKAR, Ita, KULKARNI, Mukta Vishwanath, BENČINA, Metka, KOVAČ, Janez, MRAK POLJŠAK, Katjuša, LAKOTA, Katja, SODIN-ŠEMRL, Snežna, MOZETIČ, Miran, IGLIČ, Aleš. Titanium dioxide nanotube arrays for cardiovascular stent applications. ACS omega. Apr. 7 2020, vol. 5, iss. 13, str. 7280-7289.
- BENČINA, Metka, RAWAT, Niharika, LAKOTA, Katja, SODIN-ŠEMRL, Snežna, IGLIČ, Aleš, JUNKAR, Ita. Bio-performance of hydrothermally and plasma-treated titanium : the new generation of vascular stents. International journal of molecular sciences. 2021, vol. 22, no. 21, str. 11858-1-11858-14.
- BENČINA, Metka, RESNIK, Matic, STARIČ, Pia, JUNKAR, Ita. Use of plasma technologies for antibacterial surface properties of metals. Molecules. 2021, vol. 26, no. 5, str. 1418-1-1418-27.
- RESNIK, Matic, LEVIČNIK, Eva, GOSAR, Žiga, ZAPLOTNIK, Rok, KOVAČ, Janez, EKAR, Jernej, MOZETIČ, Miran, JUNKAR, Ita. The oleofobization of paper via plasma treatment. Polymers. 2021, vol. 13, no. 13, str. 2148-1-2148-16.
- STARIČ, Pia, MRAVLJE, Jure, MOZETIČ, Miran, ZAPLOTNIK, Rok, ŠETINA, Barbara, JUNKAR, Ita, VOGEL-MIKUŠ, Katarina. The influence of glow and afterglow cold plasma treatment on biochemistry, morphology, and physiology of wheat seeds. International journal of molecular sciences. 2022, vol. 23, iss. 13, str. 7369-1-7369-23
- JUNKAR, Ita, BENČINA, Metka, RAWAT, Niharika, MIHELIČ, Rene, TREBŠE, Rihard, IGLIČ, Aleš. Synthesis of TiO2 nanostructures and their medical applications. V: KUMAR, Piyush (ur.). Oxides for medical applications. [S.l.]: Woodhead Publishing: Elsevier, 2023. Str. 107-146. Woodhead Publishing series in electronic and optical materials.
- BENČINA, Metka, JUNKAR, Ita, RAWAT, Niharika, IGLIČ, Aleš. Chapter Four - Toward novel antibacterial surfaces used for medical implants. V: IGLIČ, Aleš (ur.), RAPPOLT, Michael (ur.), LOSADA-PÉREZ, Patricia (ur.). Advances in biomembranes and lipid self-assembly. Vol. 35. 1st ed. Cambridge (MA): Elsevier: Academic Press, cop. 2022. Str. 77-94. Advances in biomembranes and lipid self-assembly, vol. 35.

INOVIRANJE PROIZVODOV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Inoviranje proizvodov
Course title:	Product innovation
Članica nosilka/UL Member:	UL FS

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0165837
Koda učne enote na članici/UL Member course code:	3832

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	15	5	0	0	95	5

Nosilec predmeta/Lecturer:	Nikola Vukašinović

Izvajalci predavanj:	Nikola Vukašinović
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies

Vsebina:	Content (Syllabus outline):
Tehnični sistem za zadostitev določenega procesa. Inovacije in inoviranje. Struktura izdelka. Nivoji konstruiranja. Povezava trga, uporabnika z proizvajalcem. Pregled procesa in podprocesov. Funkcijska struktura izdelka. Inovacija procesa in proces vstopa v proizvodni sistem. Inovacija izdelka in vstop s spremembo v proizvodni sistem. Značilni tipi proizvodnje in kako vstopamo s spremembo v posamezen tip proizvodnje. Ocena inovacije:	Technical system for a specific process. Innovations and innovating. Product structure. Levels of design. Links between the market, customer and manufacturer. Process and sub-processes survey. Functional structure of a product. Product innovation and introducing change into a production system. Typical types of production and ways of initiating a specific type of production by means of change. Innovation assessment from the economic,

ekonomska, zakonodajna, tehnična, trajnostni razvoj in marketinška. Predstavitev inovacije: v proizvodnem sistemu, uporabnikom in celotnemu okolju. Modeli predstavitve. Seminarske naloge: Pregled obstoječih izdelkov. Kritična analiza s strani snovalca izdelka in/ali uporabnika. Postavitev funkcijske strukture izdelka in nastavitev poteka uvajanje spremembe. Zasnova novega procesa, po principu »nora ideja«. Analiza procesnih stanj. Postavitev funkcijske strukture izdelka. Koncipiranje izdelka in izdelava ocene. Pregled obstoječega izdelka. Izdelava ocene izdelka: ekonomska, zakonodajna, tehnična, trajnostni razvoj in marketinška. Opredelitev potrebnih aktivnosti. Postavitev modela uvajanja inovacije v neposredno proizvodno okolje. Laboratorijske vaje: uporaba računalniških orodij v procesu iskanja priložnosti za nov izdelek.	legislative, technical, sustainable development and marketing points of view. Presenting an innovation: in the production system, to customers and the whole environment. Presentation models. Seminar work: Survey of existing products. Critical analysis by product designer and/or user. Presentation of product's functional structure and setting a schedule for the introduction of changes. Concept of a new process, following the »crazy idea« principle. Analysis of process conditions. Setting up the functional structure of a product. Conceiving a product and making an assessment. Survey of an existing product. Making a final product assessment from economic, legislative, technical, sustainable development and marketing points of view. Defining the necessary activities. Setting up a model for introducing the innovation directly into the manufacturing environment. Laboratory work: application of computer tools in the process of seeking new product opportunities.

Temeljna literatura in viri/Readings:

- Christensen, C. M. The innovator's dilemma: the revolutionary book that will change the way you do business, 1st HarperBusiness Essentials ed. New York : HarperBusiness Essentials, 2003
- Christensen, C. M., Raynor, M. E. The innovator's solution : creating and sustaining successful growth: Boston (Mass.) : Harvard Business School Press, 2003
- Hubka, V., Eder, W.E., 1988. Theory of Technical Systems: A Total Concept Theory for Engineering Design, Berlin Heidelberg: Springer-Verlag.
- Ulrich, K.T., Eppinger, S.D. (2011). Product Design and Development, Fifth Edition. Boston: McGrawHill.
- VUKAŠINOVIĆ, Nikola, DUHOVNIK, Jože. *Advanced CAD modeling : explicit, parametric, free-form CAD and re-engineering*. Cham: Springer, cop. 2019. XI, 253 str., ilustr. Springer tracts in mechanical engineering. ISBN 978-3-030-02398-0, ISBN 978-3-030-02399-7. ISSN 2195-9862. DOI: 10.1007/978-3-030-02399-7.

Cilji in kompetence:	**Objectives and competences:**
Osnovni namen predmeta je osvojiti ključna znanja iz področja razvoja inovativnih izdelkov (t.j. tehničnih sistemov). Poudarek je na sistematičnem pristopu, ki je opredmeten v metodi iskanja priložnosti za nove izdelke ter izvedbi metode v mešanih industrijsko-akademskih timih.	The main aim of the course is to acquire key knowledge in the area of innovative product development (i.e. technical systems). The emphasis is on a systematic approach, substantiated in the method for seeking new product opportunities, and on the application of methods in joint industrial/academic teams.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj je po zaključku predmeta usposobljen za samostojno in multidisciplinarno timsko delo na področju iskanja priložnosti za inovativne izdelke, pri čemer upošteva konkretno podjetje, socialne, ekonomske, tehnološke in zakonodajne dejavnike. Usposobljen je za uporabo programskih orodij, ki podpirajo razvoj inovativnih izdelkov.	After the course, students will be competent for individual and multidisciplinary team work in the area of seeking innovative product opportunities, taking account of real business, social, economic, technological and legislative factors. They will be competent independently to use programme tools that support the development of innovative products.

Metode poučevanja in učenja:	**Learning and teaching methods:**
V primeru manjšega števila študentov pod 5 bo študij izveden po predloženi literaturi in s konzultacijami.	In case of less than 5 students, the course will be carried out in the form of consultations and with the use of the provided literature.

Običajno pa s predavanji, vajami in laboratorijskimi vajami za pripravo seminarskih nalog	Regular course will include lectures, tutorials and laboratory work for the preparation of seminar works.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Kandidat lahko pristopi k ustnemu izpitu po predložitvi pozitivno ocenjene seminarske naloge.	100,00 %	A candidate can sit for an oral examination after submitting a favourable assessment of the seminar work.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Nikola Vukašinović

1. URBAS, Uroš, ZORKO, Damijan, ČERNE, Borut, TAVČAR, Jože, **VUKAŠINOVIĆ, Nikola**. A method for enhanced polymer spur gear inspection based on 3D optical metrology. *Measurement : journal of the International Measurement Confederation*, ISSN 0263-2241. [Print ed.], Feb. 2021, vol. 169, str. 1-14, ilustr. https://www.sciencedirect.com/science/article/pii/S0263224120311052, doi: 10.1016/j.measurement.2020.108584. [COBISS.SI-ID 32573699], kategorija: 1A1 (Z, A', A1/2); uvrstitev: SCI, Scopus, MBP; tip dela je verificiral OSICN
2. DEMŠAR, Ivan, ČERNE, Borut, TAVČAR, Jože, **VUKAŠINOVIĆ, Nikola**, ZORKO, Damijan. Agile development of polymer power transmission systems for e-mobility : a novel methodology based on an e-bike drive case study. *Polymers*. 2023, vol. 15, iss. 1, str. 1-24, ilustr. ISSN 2073-4360. https://www.mdpi.com/2073-4360/15/1/68, DOI: 10.3390/polym15010068. [COBISS.SI-ID 135469315], [JCR, SNIP]
3. VLAH, Daria, KASTRIN, Andrej, POVH, Janez, **VUKAŠINOVIĆ, Nikola**. Data-driven engineering design : a systematic review using scientometric approach. *Advanced engineering informatics : the science of supporting knowledge-intensive activities*. Oct. 2022, vol. 54, str. 1-19, ilustr. ISSN 1474-0346. https://www.sciencedirect.com/science/article/pii/S1474034622002324, DOI: 10.1016/j.aei.2022.101774. [COBISS.SI-ID 128198659], [JCR, SNIP, WoS, Scopus]
4. URBAS, Uroš, VLAH, Daria, **VUKAŠINOVIĆ, Nikola**. Machine learning method for predicting the influence of scanning parameters on random measurement error. *Measurement science & technology*. [Print ed.]. 2021, vol. 32, no. 6, str. 1-9, ilustr. ISSN 0957-0233. https://iopscience.iop.org/article/10.1088/1361-6501/abd57a, DOI: 10.1088/1361-6501/abd57a. [COBISS.SI-ID 49131523], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 1, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0,00, Scopus do 9. 8. 2022: št. citatov (TC): 2, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,33]
5. URBAS, Uroš, HRGA, Timotej, POVH, Janez, **VUKAŠINOVIĆ, Nikola**. Novel alignment method for optical 3D gear metrology of spur gears with a plain borehole. *Measurement : journal of the International Measurement Confederation*. [Print ed.]. Mar. 2022, vol. 192, str. 1-10, ilustr. ISSN 0263-2241. https://www.sciencedirect.com/science/article/pii/S0263224122001336, DOI: 10.1016/j.measurement.2022.110839. [COBISS.SI-ID 98561539], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,50, Scopus do 1. 10. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,50]
6. URBAS, Uroš, ZORKO, Damijan, **VUKAŠINOVIĆ, Nikola**. Machine learning based nominal root stress calculation model for gears with a progressive curved path of contact. *Mechanism and machine theory*. Nov. 2021, vol. 165, str. 1-14, ilustr. ISSN 0094-114X. https://www.sciencedirect.com/science/article/pii/S0094114X21001889, DOI: 10.1016/j.mechmachtheory.2021.104430. [COBISS.SI-ID 69206531], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 3, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,33, Scopus do 22. 5. 2022: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,67]

INTERAKCIJE MED PATOGENI IN GOSTITELJI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Interakcije med patogeni in gostitelji
Course title:	Host-pathogen interactions
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0037286

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	15	0	0	5	95	5

Nosilec predmeta/Lecturer:	Peter Dovč
Izvajalci predavanj:	Peter Dovč, Minja Zorc
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	Basic preconditions for enrolment into doctoral studies.

Vsebina:	Content (Syllabus outline):
Proučevanje interakcij med različnimi gostitelji in različnimi patogeni poteka (H-P) na nivoju organizmov, celic gostitelja in mikroba ter na nivoju celične signalizacije in izražanje genov. Za to so v uporabi različne metode, s katerimi proučujemo dogajanja v gostitelju kot tudi v mikrobu. Namen študij je odkrivanje mehanizmov delovanja in/ali možna aplikacija. V okviru predmeta bodo predstavljeni različni primeri odnosa med gostiteljem	The study of interactions between different hosts and a variety of pathogens is carried out (H-P) at the level of organisms, host or pathogen cells and on the level of cell signalling and gene expression. Different methods and approaches are used to study the events that are very complex. The aim of studies of human or animal pathogens and specific hosts or of H-P interactions in animal models is to understand basic molecular mechanisms and/or possible applications.

in patogenom: vsakič bo predstavljena osnovna problematika in namen, nato pa pristop k proučevanju le te, vključno z metodami in analizo podatkov. Mikoplazme, kot primer mikrobov brez celične stene in interakcije z gostiteljem, ter vpliv gostiteljevega odziva na mikoplazme. Ali okužba z mikoplazmo inducira avtoimunsko bolezen? Učinek sočasnih okužb. Proučevanje naravne imunosti oz aktivacije imunskega odziva preko TLR . Okužbe mlečne žleze in tumorigeneza. Uporaba živalskih modelov (mišk) v proučevanju H-P interakcij. Okužba prebavnega trakta s Helicobacter pylori – vzrok za nastanek raka na črevesju? H-P interakcije pri rastlinah.	The course will present examples of H-P interactions: authors will present the background and the aim of the study they performed along with methods and results. Students are expected to have read the study (paper) first and participate actively in the discussion in course. Topics: Mycoplasmas: microbes without cell wall. Can they induce autoimmune disease? How do they influence on simultaneous infections with viruses? Infections of the mammary gland and tumorigenesis. Animal models in H-P interactions research. Infection with Helicobater pylori and tumorigenesis. H-P interactions in plants.

Temeljna literatura in viri/Readings:

Paul-Pierre Pastoret, Philip Griebel, Hervé Bazin, André Govaerts. 1998. Handbook of Vertebrate Immunology. 1st Edition, London, Academic press.
Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne.2000. Kuby Immunoogy. 4th ed. New York, WHFreeman and Company.
Dodatni viri: relevantne znanstvene objave, ki bodo slušateljem posredovane vsako leto v naprej.

Cilji in kompetence:	**Objectives and competences:**
• spoznati kompleksnost interakcij med patogeni in gostitelji • spoznati pristope za proučevanje • spoznati možnosti in delo na tem področju v slovenskem in mednarodnem prostoru • razviti sposobnosti razumevanja in analiziranja znanstvenih člankov in razviti sposobnost znanstvene diskusije na temo H-P interakcije	• to recognize the complexity of H-P interactions • to recognize the approaches and methods • to get the insight into the H-P research projects • to develop the capability of understanding and analyzing of scientific papers as well as develop the capability of scientific discussion

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Poznavanje aktualnih problematik H-P in možnosti (sistemov, načinov, pristopov, metod) za študij le teh in za razvoj biotehnoloških aplikacij. Razumevanje pomena raziskovanja na področju H-P interakcij. Sposobnost samostojnega študija problema z branjem znanstvene literature.	Knowledge and understanding: Knowledge of up-to date problems of host-pathogen interactions (H-P) and possibilities (methods, approach) for research. They will understand the importance of the research of H-P interactions. They should gain the ability to understand the problem and find the application/solution based on biotechnology approach. Students should gain the ability of self-dependent studying scientific papers.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Osnova so znanstveni članki (predavatelji so soavtorji), ki jih bodo kandidati prebrali/preštudirali v naprej. Posamezno predavanje bo namenjeno širši predstavitvi tematike, ki je obravnavana v posameznem članku. Sledil bo seminar, namenje diskusiji, kjer se predvideva aktivno sodelovanje študentov.	Scientific papers will be delivered in advance. Lecturer, which is a co-author of the paper, will present the background of the research. In the seminar students will take an active part. Additional explanation of methods/ results will be provided by lecturer.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Izpit	80,00 %	Exam

Seminar	20,00 %	Seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Peter Dovč:

1.ZULIANI, Anna, CONTIERO, B., SCHNEIDER, M. K., ARSENOS, G., BERNUÉS, Alberto, **DOVČ, Peter**, GAULY, Matthias, HOLAND, Ø., MARTIN, B., MORGAN-DAVIES, C., ZOLLITSCH, Werner, COZZI, Giulio. Topics and trends in mountain livestock farming research : a text mining approach. *Animal : the international journal of animal biosciences*. [Online ed.]. 2021, vol. 15, no. 1, str. 1-7, ilustr. ISSN 1751-732X.

2.**DOVČ, Peter**. Markers and antibodies for characterization of goat mammary tissue and the derived primary epithelial cell cultures. *Revista Brasileira de Zootecnia*. 2020, vol. 49, e 20180164, str. 1-9, ilustr. ISSN 1806-9290. https://www.rbz.org.br/wp-content/uploads/articles_xml/1806-9290-rbz-49-e20180164/1806-9290-rbz-49-e20180164.pdf, DOI: 10.37496/rbz4920180164. [COBISS.SI-ID 19192579]

3.OGOREVC, Jernej, SIMČIČ, Mojca, ZORC, Minja, ŠKRJANC, Monika, **DOVČ, Peter**. TLR2 polymorphism (rs650082970) is associated with somatic cell count in goat milk. *PeerJ*. 31. jul. 2019, vol. 7, str. 1-9, e-7340, ilustr. ISSN 2167-8359. https://peerj.com/articles/7340.pdf, DOI: 10.7717/peerj.7340. [COBISS.SI-ID 4274568]

4.URH, Kristian, KOLENC, Živa, HROVAT, Maj, SVET, Luka, **DOVČ, Peter**, KUNEJ, Tanja. Molecular mechanisms of syndromic cryptorchidism : data synthesis of 50 studies and visualization of gene-disease network. *Frontiers in endocrinology*. 26 Jul 2018, vol. 9, no. 425, str. 1-11, ilustr. ISSN 1664-2392. https://www.frontiersin.org/articles/10.3389/fendo.2018.00425/full, DOI: 10.3389/fendo.2018.00425. [COBISS.SI-ID 4109704]

5. MIKEC, Špela, ŠIMON, Martin, MORTON, Nicholas M., ATANUR, Santosh S., KONC, Janez, **DOVČ, Peter**, HORVAT, Simon, KUNEJ, Tanja. Genetic variants of the hypoxia-inducible factor 3 alpha subunit (Hif3a) gene in the Fat and Lean mouse selection lines. *Molecular biology reports*. 2022, vol. 49, no. 6, str. 4619-4631, ilustr. ISSN 1573-4978. https://link.springer.com/article/10.1007/s11033-022-07309-0, DOI: 10.1007/s11033-022-07309-0. [COBISS.SI-ID 102709507].

6. ASHJA, Ali, ZORC, Minja, DOVČ, Peter. Genome-wide association study for milk somatic cell score in Holstein Friesian cows in Slovenia. *Animals*. 2024, vol. 14, iss. 18, [article no.] 2713, 16 str., ilustr. ISSN 2076-2615. https://www.mdpi.com/2076-2615/14/18/2713, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.3390/ani14182713. [COBISS.SI-ID 208198403].

7. ZORC, Minja, DOLINAR, Mateja, DOVČ, Peter. A single-cell transcriptome of bovine milk somatic cells. *Genes*. 2024, vol. 15, no. 3, [article no.] 349, str. 1-13, ilustr. ISSN 2073-4425. https://www.mdpi.com/2073-4425/15/3/349, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.3390/genes15030349. [COBISS.SI-ID 188325123],

8. KRGOVIĆ, Danijela, GORENJAK, Mario, RIHAR, Nika, OPALIČ, Iva, STANGLER HERODEŽ, Špela, GREGORIČ KUMPERŠČAK, Hojka, DOVČ, Peter, KOKALJ-VOKAČ, Nadja. Impaired neurodevelopmental genes in Slovenian autistic children elucidate the comorbidity of autism with other developmental disorders. *Frontiers in molecular neuroscience*. Jun. 2022, vol. 15, str. 1-17, ilustr. ISSN 1662-5099. https://doi.org/10.3389/fnmol.2022.912671, https://www.frontiersin.org/articles/10.3389/fnmol.2022.912671/full, Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: 10.3389/fnmol.2022.912671. [COBISS.SI-ID 112881155],

9. ZORC, Minja, ŠKORPUT, Dubravko, GVOZDANOVIĆ, Kristina, MARGETA, Polona, KAROLYI, Danijel, LUKOVIĆ, Zoran, SALAJPAL, Krešimir, SAVIĆ, Radomir, MUÑOZ, Maria, BOVO, Samuele, DJURKIN KUŠEC, Ivona, RADOVIĆ, Čedomir, KUŠEC, Goran, ČANDEK-POTOKAR, Marjeta, DOVČ, Peter. Genetic diversity and population structure of six autochthonous pig breeds from Croatia, Serbia, and Slovenia. *Genetics selection evolution*. [Online ed.]. 2022, vol. 54, no. 1, str. 1-23, ilustr. ISSN 1297-9686. https://gsejournal.biomedcentral.com/articles/10.1186/s12711-022-00718-6, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.1186/s12711-022-00718-6. [COBISS.SI-ID 106306307],

10. NOVOSEL, Dinko, BRAJKOVIC, Vladimir, SIMČIČ, Mojca, ZORC, Minja, ŠVARA, Tanja, BRANOVIĆ-ČAKANIĆ, Karmen, JUNGIĆ, Andreja, LOGAR, Betka, ČUBRIĆ ČURIK, Vlatka, DOVČ, Peter, ČURIK, Ino. The consequences of mitochondrial T10432C mutation in Cika cattle : A "potential" model for Leber's hereditary optic neuropathy. *International journal of molecular sciences*. 2022, no. 11, art. 6335, str.

1-15, ilustr. ISSN 1422-0067. https://www.mdpi.com/1422-0067/23/11/6335, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.3390/ijms23116335. [COBISS.SI-ID 110712835].

Minja Zorc:

1. RISTANIĆ, Marko, ZORC, Minja, GLAVINIĆ, Uroš, STEVANOVIĆ, Jevrosima, BLAGOJEVIC, Jovan, MALETIĆ, Milan, STANIMIROVIĆ, Zoran. Genome-wide analysis of milk production traits and selection signatures in Serbian Holstein-Friesian cattle. *Animals*. 2024, vol. 14, no. 5, [art. no.] 669, str. 1-13. ISSN 2076-2615. https://www.mdpi.com/2076-2615/14/5/669, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.3390/ani14050669. [COBISS.SI-ID 186289923]

2. ŠARAN, Momčilo, ŠTRBAC, Ljuba, JANKOVIĆ, Dobrila, DJAN, Mihajla, TRIVUNOVIĆ, Snežana, ZORC, Minja. Genomic characterization of Serbian Holstein-Friesian cattle population. *Czech Journal of Animal Science*. 2023, vol. 68, iss. 12, str. 486-496, ilustr. ISSN 1212-1819. https://cjas.agriculturejournals.cz/corproof.php?tartkey=cjs-000003-1724, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.17221/89/2023-CJAS. [COBISS.SI-ID 178108675]

3. GLAVINIĆ, Uroš, DZOGOVIC, Danica, JELISIC, Stefan, RISTANIĆ, Marko, ZORC, Minja, ALEKSIC, Nevenka, STANIMIROVIĆ, Zoran. Oxidative status of honey bees infected with Nosema ceranae microsporidium and supplemented with Agaricus bisporus mushroom extract. *Veterinarski glasnik*. 2022, vol. 77, iss. 1, str. 35-50, ilustr. ISSN 2406-0771. http://www.doiserbia.nb.rs/Article.aspx?ID=0350-24572200013G#.Y3d-kzhhaM-, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.2298/VETGL220715013G. [COBISS.SI-ID 130012419]

4. TESOVNIK, Tanja, ZORC, Minja, RISTANIĆ, Marko, GLAVINIĆ, Uroš, STEVANOVIĆ, Jevrosima, NARAT, Mojca, STANIMIROVIĆ, Zoran. Exposure of honey bee larvae to thiamethoxam and its interaction with Nosema ceranae infection in adult honey bees. *Environmental pollution*. [Print ed.]. Jan. 2020, vol. 256, no. 113443, str. 1-10. ISSN 0269-7491. https://doi.org/10.1016/j.envpol.2019.113443, Repozitorij Univerze v Ljubljani – RUL, DOI: 10.1016/j.envpol.2019.113443. [COBISS.SI-ID 4319112]

5. TESOVNIK, Tanja, ZORC, Minja, GREGORC, Aleš, RINEHART, Timothy, ADAMCZYK, John, NARAT, Mojca. Immune gene expression in developing honey bees (Apis mellifera L.) simultaneously exposed to imidacloprid and Varroa destructor in laboratory conditions. *Journal of Apicultural Research*. 2019, vol. 58, no. 5, str. 730-739, ilustr. ISSN 0021-8839. https://www.tandfonline.com/doi/pdf/10.1080/00218839.2019.1634463?needAccess=true, DOI: 10.1080/00218839.2019.1634463. [COBISS.SI-ID 4261000]

6. GLAVINIC, Uros, TESOVNIK, Tanja, STEVANOVIĆ, Jevrosima, ZORC, Minja, CIZELJ, Ivanka, STANIMIROVIĆ, Zoran, NARAT, Mojca. Response of adult honey bees treated in larval stage with prochloraz to infection with Nosema ceranae. *PeerJ*. 8. feb. 2019, vol. 7, no. 02, str. 1-18, 6325, ilustr. ISSN 2167-8359. https://peerj.com/articles/6325.pdf, DOI: 10.7717/peerj.6325. [COBISS.SI-ID 4182408

INTERAKCIJE V BIOLOGIJI RASTLIN

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Interakcije v biologiji rastlin
Course title:	Interactions in plant biology
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0594913
Koda učne enote na članici/UL Member course code:	0

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	15	80	5

Nosilec predmeta/Lecturer:	Marjana Regvar

Izvajalci predavanj:	Jasna Dolenc Koce, Kristina Gruden, Matevž Likar, Marjana Regvar, Katarina Vogel Mikuš
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General prerequisites for enrolment in doctoral studies

Vsebina:	Content (Syllabus outline):
Razumevanje rastlinskih interakcij z drugimi organizmi je trenutno hitro razvijajoče področje s pomembnimi posledicami za življenje na zemlji. Poznavanje interakcij rastlin z mikroorganizmi je v zadnjih letih zelo napredovalo, razumevanje več-trofičnih interakcij rastlin z ostalimi organizmi pa je še neraziskano. Intenzivno sekvenciranje genomov	Knowledge on plant interactions with organisms is a rapidly evolving field, with long-term consequences for life on Earth. A wealth of knowledge accumulated in recent years expanding our understanding of plant interactions with microbes, while the information on multi-trophic interactions are still at their infancy. Extensive genome sequencing of plants and

rastlin in mikrobov nudi vpogled v udeleženost ključnih genov v regulacijo različnih interakcij, od mutualističnih do antagonističnih. Prav tako smo prišli do novih spoznanj v genski regulaciji interakcij rastlin z drugimi rastlinami, ki so osnova za poznavanje biologije parazitskih rastlin ter invazivnosti rastlin. Predmet obravnava interakcije rastlin z drugimi organizmi na različnih ravneh biološke organizacije in vključuje zadnja spoznanja rastlinske biokemije, molekulske in sistemske biologije. Predstavljene bodo tudi najnovejše tehnike raziskav v biologiji rastlinskih interakcij.	microorganisms revealed the involvement of the key genes regulating diverse interactions, from mutualisms to antagonisms. Also, new insights in the gene regulation of plant-plant interactions contributes to our understanding on biology of parasitic plants and plant invasions. The course focuses on the plant interactions with organisms at different levels of biological organization and includes recent advances in plant biochemistry, molecular biology and systems biology. The latest technology application in plant interactions research will be presented.

Temeljna literatura in viri/Readings:

Lugtenberg B. Principles of Plant-Microbe Interactions. Microbes for Sustainable Agriculture, Springer International Publishing , 2015
Varma A., Kharkwal AC. Symbiotic Fungi, Principles and Practice, Springer-Verlag Berlin Heidelberg (D), 2009
Varma A., Prasad R., Tuteja N. Mycorrhiza- Function, Diversity, State of the art, 4th ed. Springer International Publishing, 2017
Tekoča znanstvena periodika in pregledni članki s področij: fiziologije, anatomije, morfologije in raziskovalne metodologije

Cilji in kompetence:	**Objectives and competences:**
Temeljni izobraževalni cilj je razumevanje mehanizmov interakcij rastlin z drugimi organizmi ter njihove regulacije. Pri tem se povezujejo ravni od molekule in celice do odnosa organizmov z živim in neživim okoljem. Študent pridobi kompetence pri razumevanju procesov v rastlinah in osvoji analizne in statistične metode, ki se uporabljajo pri raziskavah na tem področju	The educational aim of the course is to understand mechanisms that govern functioning of plant interactions with other organisms and gain knowledge of their regulation. In this the levels of organisation from molecules and cells to interactions with biotic and abiotic environment are considered. Students gain competences in understanding of processes in plants and acquires knowledge on analytical and statistical methods from the field

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Predviden študijski rezultat je nadgraditi in povezati znanje s področja rastlinskih interakcij in uporaba novega znanja za razumevanje delovanja organizmov pod vplivom biotskih in abiotskih dejavnikov. Študenti bodo pridobili metodološka znanja za celostno obravnavo interakcij s posledicami za organizme in njihovo okolje.	Knowledge and understanding: The course is aiming to upgrade and integrate the competences and knowledge from the fields of plant interactions, and to apply the acquired knowledge in understanding functions of organisms under adverse biotic and abiotic conditions. Students will obtain methodological skills that will allow them integral discussion about interactions and their effects on organisms and environment.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusijske delavnice predstavljenih seminarjev, predstavitve v laboratorijih. Pri izvajanju sodelujejo vabljeni predavatelji. Izvedba je prilagojena raziskovalni tematiki študenta	Lectures, workshops with seminars, lab presentations in cooperation with invited lecturers. The course is adjusted to the research field of the student

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni izpit iz tem predavanj.	50,00 %	Written examination
Predstavitev individualnega projekta	50,00 %	Project presentation

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

prof. dr. Marjana Regvar

POTISEK, Mateja, LIKAR, Matevž, VOGEL-MIKUŠ, Katarina, ARČON, Iztok, GRDADOLNIK, Jože, **REGVAR, Marjana**. 1,8-dihydroxy naphthalene (DHN) - melanin confers tolerance to cadmium in isolates of melanised dark septate endophytes. *Ecotoxicology and environmental safety*. 2021, vol. 222, str. 1-9. [COBISS.SI-ID 70067203]

MRAVLJE, Jure, **REGVAR, Marjana**, STARIČ, Pia, MOZETIČ, Miran, VOGEL-MIKUŠ, Katarina. Cold plasma affects germination and fungal community structure of buckwheat seeds. *Plants*. 2021, vol. 10, no. 5, str. 1-18. [COBISS.SI-ID 61089795]

HANČEVIĆ, Katarina, ČARIJA, Mate, RADIĆ BRKANAC, Sandra, GAŠI, Emanuel, LIKAR, Matevž, ZDUNIĆ, Goran, **REGVAR, Marjana**, RADIĆ, Tomislav. Grapevine leafroll-associated virus 3 in single and mixed infections triggers changes in the oxidative balance of four grapevine varieties. *International journal of molecular sciences*. Jan. 2023, vol. 24, iss. 1, [1]-16, [COBISS.SI-ID 136465667]

RADIĆ, Tomislav, LIKAR, Matevž, HANČEVIĆ, Katarina, **REGVAR, Marjana,** ČARIJA, Mate, ZDUNIĆ, Goran. Root-associated community composition and co-occurrence patterns of fungi in wild grapevine. *Fungal ecology*. Apr. 2021, vol. 50, str. 1-11. [COBISS.SI-ID 54233603]

RADIĆ, Tomislav, LIKAR, Matevž, HANČEVIĆ, Katarina, REGVAR, Marjana, ČARIJA, Mate, ZDUNIĆ, Goran. Dataset on endophytic and rhizoplane fungi on the roots of wild grapevine in Croatia and Bosnia and Herzegovina. *Fungal ecology*. Feb. 2021, vol. 34, str. 1-5. [COBISS.SI-ID 54284803]

prof. dr. Kristina Gruden

LIU, Tianyuan, SALGUERO, Pedro, PETEK, Marko, MARTINEZ-MIRA, Carlos, BALZANO-NOGUEIRA, Leandro, RAMŠAK, Živa, MCINTYRE, Lauren, GRUDEN, Kristina, TARAZONA, Sonia, CONESA, Ana. PaintOmics 4 : new tools for the integrative analysis of multi-omics datasets supported by multiple pathway databases. *Nucleic acids research*. 2022, vol. 50, iss. w1, str. w551-w559

TOMAŽ, Špela, PETEK, Marko, LUKAN, Tjaša, POGAČAR, Karmen, STARE, Katja, TEIXEIRA PRATES, Erica, JACOBSON, Daniel A., ZRIMEC, Jan, BAJC, Gregor, BUTALA, Matej, POMPE NOVAK, Maruša, TALER-VERČIČ, Ajda, USENIK, Aleksandra, TURK, Dušan, COLL RIUS, Anna, GRUDEN, Kristina, et al. A mini-TGA protein modulates gene expression through heterogeneous association with transcription factors. *Plant physiology*. 2022, str. 1-54

FOIX, Laura, NADAL, Anna, ZAGORŠČAK, Maja, RAMŠAK, Živa, ESTEVE-GODINA, Anna, GRUDEN, Kristina, PLA, Maria. Prunus persica plant endogenous peptides PpPep1 and PpPep2 cause PTI-like transcriptome reprogramming in peach and enhance resistance to Xanthomonas arboricola pv. pruni. *BMC genomics*. 2021, vol. 22, str. 1-18,

DERMASTIA, Marina, ŠKRLJ, Blaž, STRAH, Rebeka, ANŽIČ, Barbara, TOMAŽ, Špela, KRIŽNIK, Maja, SCHÖNHUBER, Christina, RIEDLE-BAUER, Monika, RAMŠAK, Živa, PETEK, Marko, KLADNIK, Aleš, LAVRAČ, Nada, GRUDEN, Kristina, ROITSCH, Thomas, BRADER, Günter, POMPE NOVAK, Maruša. Differential response of grapevine to Infection with 'Candidatus Phytoplasma solani' in early and late growing season through complex regulation of mRNA and small RNA transcriptomes. *International journal of molecular sciences*. 1 Apr. 2021,
vol. 22, no. 7, str. 3531-1-3531-28

LUKAN, Tjaša, POMPE NOVAK, Maruša, BAEBLER, Špela, TUŠEK-ŽNIDARIČ, Magda, KLADNIK, Aleš, KRIŽNIK, Maja, BLEJEC, Andrej, ZAGORŠČAK, Maja, STARE, Katja, DUŠAK, Barbara, COLL RIUS, Anna, POLLMANN, Stephan, MORGIEWICZ, Karolina, HENNIG, Jacek, GRUDEN, Kristina. Precision transcriptomics of viral foci reveals the spatial regulation of immune-signaling genes and identifies RBOHD as an important player in the incompatible interaction between potato virus Y and potato. *The Plant journal*. 2020, vol. 104, iss. 3, str. 645-661

prof. dr. Katarina Vogel-Mikuš

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Doc. dr. Jasna Dolenc Koce
PRŠIN, Tjaša, ANŽLOVAR, Sabina, DOLENC KOCE, Jasna. The effect of thyme essential oil on germination and early growth of wheat = Vpliv timijanovega eteričnega olja na kalitev in zgodnjo rast pšenice. *Acta biologica slovenica : ABS*. [Tiskana izd.]. 2018, vol. 61, št. 1, str. 3-11. ISSN 1408-3671.
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ANŽLOVAR, Sabina, LIKAR, Matevž, DOLENC KOCE, Jasna. Antifungal potential of thyme essential oil as a preservative for storage of wheat seeds. *Acta botanica Croatica : an international joural of botany*. 2017, vol. 76, no. 1, str. 64-71. ISSN 0365-0588.
DOLENC KOCE, Jasna. Effects of exposure to nano and bulk sized TiO [sub] 2 and CuO in Lemna minor. *Plant physiology and biochemistry*. [Print ed.]. 2017, vol. 119, str. 43-49. ISSN 0981-9428.
DOLENC KOCE, Jasna. The effects of leaf extracts of crack willow (Salix fragilis) on the growth of Japanese knotweed (Fallopia japonica) = Vpliv listnih izvlečkov krhke vrbe (Salix fragilis) na rast japonskega dresnika (Fallopia japonica). *Acta biologica slovenica : ABS*. [Tiskana izd.]. 2016, vol. 59, št. 1, str. 13-21. ISSN 1408-3671.
DOLENC KOCE, Jasna, DROBNE, Damjana, KLANČNIK, Katja, MAKOVEC, Darko, NOVAK, Sara, HOČEVAR, Matej. Oxidative potential of ultraviolet-A irradiated or nonirradiated suspensions of titanium dioxide or silicon dioxide nanoparticles on Allium cepa roots. *Environmental toxicology and chemistry*. 2014, vol. 33, no. 4, str. 858-867. ISSN 0730-7268.

Doc. dr. Matevž Likar
LIKAR, Matevž, GRAŠIČ, Mateja, STRES, Blaž, REGVAR, Marjana, GABERŠČIK, Alenka. Original leaf colonisers shape fungal decomposer communities of Phragmites australis in intermittent habitats. *Journal of fungi*. 2022, vol. 8, iss. 3, str. 1-14, ilustr. ISSN 2309-608X. https://www.mdpi.com/2309-608X/8/3/284/htm, DOI: 10.3390/jof8030284. [COBISS.SI-ID 101081859]
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PERINI, Laura, GOSTINČAR, Cene, LIKAR, Matevž, FRISVAD, J. C., KOSTANJŠEK, Rok, NICHOLES, M., WILLIAMSON, C., ANESIO, A. M., ZALAR, Polona, GUNDE-CIMERMAN, Nina. Interactions of fungi and algae from the Greenland ice sheet. *Environmental microbiology*. [Print ed.]. ISSN 1462-2912.

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LIKAR, Matevž, GRANDIČ, Marjana, JAKOVAC-STRAJN, Breda, KOS, Katarina, CELAR, Franci Aco. Links between genetic groups, host specificity, and ergot-alkaloid profiles within Claviceps purpurea (Fr.) Tul. on Slovenian grasses. *Plant disease*. 2018, vol. 102, no. 7, str. 1334-1340. ISSN 0191-2917. https://doi.org/10.1094/PDIS-08-17-1179-RE, DOI: 10.1094/PDIS-08-17-1179-RE. [COBISS.SI-ID 4746063]

INTERKACIJE MED GENOTIPI IN OKOLJEM PRI KMETIJSKIH RASTLINAH

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Interkacije med genotipi in okoljem pri kmetijskih rastlinah
Course title:	Interactions between genotypes and environment inthe agricultural plants
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037246
Koda učne enote na članici/UL Member course code:	3748

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	25	0	0	5	85	5

Nosilec predmeta/Lecturer:	Zlata Luthar

Izvajalci predavanj:	Zlata Luthar
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrollment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Elastičnost genetsko pogojenih odzivov rastlin na biotski stres, agrotehnične ukrepe in na druge abiotske vplive okolja (suša, slanost tal, bolezni in škodljivci itd). Vloga generativnega oziroma vegetativnega razmnoževanja rastlin ter majhnih RNAs molekul pri evolucijskih prilagoditvah na različne stresne situacije. Genetski polimorfizem in vpliv genetske strukture sort na biotsko	The adaptability of genetic responses of plants on the biotic stress, agro technical measures and other abiotic environmental conditions (drought, soil salinity, diseases and pests, etc.). The role of generative or vegetative propagation of plants and small RNAs molecules in the evolutionary adaptations to different stress situations. Genetic polymorphism and the impact of genetic structure of

raznovrstnost. Abiotski vplivi, ki so povzročili evolucijske adaptacije rastlin in vplivi naravnih in induciranih sevanj. Razlike v adaptaciji pri različnih rastlinskih vrstah, ki so povezane s kmetijsko prakso. Obramba in prilagajanje rastlin na abiotske dejavnike, ki pogojujejo sintezo flavonoidov, taninov in drugih snovi, ki ščitijo rastline in njihov pomen v prehrani. Raziskovanje reakcij rastlin na različne tehnologije pridelave kot osnova zagotavljanja kakovosti pridelkov. Alokacija asimilatov kot sestavni del poteka uravnavanja rasti in razvoja kmetijskih rastlin. Pomen interakcije genotip×patogen v koevoluciji in adaptaciji gojenih in drugih rastlin. Evolucijska adaptacija na opraševalce. Vloga koevolucije in interakcije pri žlahtnjenju novih sort. Genetska struktura posameznih tipov sort, njihova stabilnost in vzdrževanje genetske identičnosti, principi in metode molekulskih markerjev kot pomoč pri ciljnem žlahtnjenju novih tolerantnih sort za specifične stresne namene.	varieties on biodiversity. Abiotic influences that have led to evolutionary adaptations of plants and the effects of natural and induced radiation. Differences in adaptation at different plant species that are connected with agricultural practices. Defense and adaptation of plants to abiotic factors that determine the synthesis of flavonoids, tannins and other substances that protect plants and their importance in the nutrition. Study the reactions of plants to different production technology as the base of quality assurance of the products. Allocation of assimilates as part of the growth and development balancing of agricultural plants. The importance of the interaction genotype × pathogen in co-evolution and adaptation of cultivated and other plants. Evolutionary adaptation to pollinators. The role of co-evolution and interaction in selection of new varieties. Genetic structure of different types of varieties, their stability and the maintenance of genetic identity, principles and methods of molecular markers as an aid in targeted breeding varietal selection of new tolerant varieties for specific stress purposes.

Temeljna literatura in viri/Readings:

Brown J., Caligari P.D.S., Campos H.A. 2014. Plant Breeding, Edition: 2nd, Wiley Blackwell Publ., ISBN: 978-0-470-65829-1 (cloth), ISBN: 978-0-470-65830-7 (pbk.), 278 s.
Shanker A.K., Shanker C. 2016. Abiotic and Biotic Stress in Plants - Recent Advances and Future Perspectives, Intech, ISBN - 953-51-4209-7; 953-51-2250-9, 754 s.
http://www.intechopen.com/books/abiotic-and-biotic-stress-in-plants-recent-advances-and-future-perspectives

Priporočena literatura in viri vezani na seminar/Readings:

Revijalni članki s področja, tekoča periodika, druga učna gradiva

Magazine articles from the field, current periodicals, other teaching materials

Cilji in kompetence:	**Objectives and competences:**
Seznaniti študente z interakcijami med genetskimi in ekološkimi dejavniki pri vzgoji novih genotipov s specifičnimi lastnostmi in za specifične rastne razmere (sušni/temperaturni stresi, ...). Naučiti študente prepoznavati in razčlenjevati vplive na rast in razvoj kmetijskih rastlin ter različnih tipov sort. Seznaniti študente z najnovejšo literaturo na tem področju. Posredovati študentom aktualno znanje na področju koevolucije in evolucijskih adaptacij rastlin.	To acquaint students with the interactions between genetic and environmental factors in the education of new genotypes with specific properties and for specific growing conditions (drought / temperature stress ...). To teach students to identify and analyze the impacts on the growth and development of agricultural plants as well as on the different types of varieties. To acquaint students with the recent literature on this subject. To provide students with current knowledge in the field of co-evolution and evolutionary adaptations of plants.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Usposobiti študente za prepoznavanje in razčlenjevanje genetskih in ekoloških vplivov na rast in razvoj genotipov ter za samostojno vzgojo novih	Knowledge and understanding: Teach students how to recognize and analyze genetic and ecological impacts on the growth and development of genotypes and independent raising of

sort kmetijskih rastlin s specifičnimi lastnostmi v povezavi z molekuskimi analizami.	new crop varieties with specific properties in conjunction with molecular analyzes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Študij pri tem predmetu bo organiziran s predavanji, konzultacijami in seminarskim delom.	Studies in this course will be organized with lectures, consultations, and seminar work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminarska naloga	30,00 %	Seminar work
Predstavitev izpit	70,00 %	Presentation exsamination

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

ZLATA LUTHAR

1. UNUK NAHBERGER, Tina, GREBENC, Tine, ŽLINDRA, Daniel, MRAK, Tanja, LIKAR, Matevž, KRAIGHER, Hojka, **LUTHAR, Zlata**. Buckwheat milling waste effects on root morphology and mycorrhization of Silver fir seedlings inoculated with Black Summer Truffle (Tuber aestivum Vittad.). *Forests*. [Online ed.]. 2022, iss. 2, art. 240, 16 str. ISSN 1999-4907. https://doi.org/10.3390/f13020240, https://www.mdpi.com/1999-4907/13/2/240, https://dirros.openscience.si/IzpisGradiva.php?id=14741, DOI: 10.3390/f13020240. [COBISS.SI-ID 96704259], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 2, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,14, Scopus do 19. 7. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,29]
2. **LUTHAR, Zlata**, GOLOB, Aleksandra, GERM, Mateja, VOMBERGAR, Blanka, KREFT, Ivan. Tartary buckwheat in human nutrition. *Plants*. 2021, vol. 10, no. 4 (700), str. 1-14, ilustr. ISSN 2223-7747. https://doi.org/10.3390/plants10040700, DOI: 10.3390/plants10040700. [COBISS.SI-ID 58610179], [JCR, SNIP, WoS do 19. 1. 2023: št. citatov (TC): 20, čistih citatov (CI): 20, čistih citatov na avtorja (CIAu): 4,00, Scopus do 13. 2023: št. citatov (TC): 22, čistih citatov (CI): 22, čistih citatov na avtorja (CIAu): 4,40]
3. **LUTHAR, Zlata**, ZHOU, Meiliang, GOLOB, Aleksandra, GERM, Mateja. Breeding buckwheat for increased levels and improved quality of protein. *Plants*. 2021, vol. 10, no. 1, art. 14, str. 1-12, ilustr. ISSN 2223-7747. https://doi.org/10.3390/plants10010014, DOI: 10.3390/plants10010014. [COBISS.SI-ID 44524547], [JCR, SNIP, WoS do 12. 2. 2023: št. citatov (TC): 7, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 1,75, Scopus do 4. 2. 2023: št. citatov (TC): 10, čistih citatov (CI): 10, čistih citatov na avtorja (CIAu): 2,50]
4. **LUTHAR, Zlata**, FABJAN, Primož, MLINARIČ, Katja. Biotechnological methods for buckwheat breeding. *Plants*. 2021, vol. 10, no. 8 (1547), str. 1-22, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/10/8/1547, DOI: 10.3390/plants10081547. [COBISS.SI-ID 72254211], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,67, Scopus do 1 10. 2022: št. citatov (TC): 3, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 1,00]
5. ZHANG, Kaixuan, HE, Ming, FAN, Yu, ZHAO, Hui, GAO, Bin, YANG, Keli, LI, Faliang, TANG, Yu, GAO, Qiang, LIN, Tao, QUINET, Murielle, JANOVSKÁ, Dagmar, MEGLIČ, Vladimir, KWIATKOWSKI, Jacek, ROMANOVA, Olga, CHRUNGOO, Nikhil K., SUZUKI, Tatsuro, **LUTHAR, Zlata**, GERM, Mateja, WOO, Sun Hee, GEORGIEV, Milen I., ZHOU, Meiliang. Resequencing of global Tartary buckwheat accessions reveals multiple domestication events and key loci associated with agronomic traits. *Genome biology*. [Online ed.]. 12 Jan. 2021, vol. 22, article no. 23, str. 1-17, ilustr. ISSN 1474-760X. https://genomebiology.biomedcentral.com/articles/10.1186/s13059-020-02217-7, DOI: 10.1186/s13059-020-02217-7. [COBISS.SI-ID 46475779], [JCR, SNIP, WoS do 8. 2. 2023: št. citatov (TC): 32, čistih citatov (CI): 26, čistih citatov na avtorja (CIAu): 1,94, Scopus do 10. 2. 2023: št. citatov (TC): 36, čistih citatov (CI): 32, čistih citatov na avtorja (CIAu): 2,38]
6. **LUTHAR, Zlata**, GERM, Mateja, LIKAR, Matevž, GOLOB, Aleksandra, VOGEL-MIKUŠ, Katarina, PONGRAC, Paula, KUŠAR, Anita, PRAVST, Igor, KREFT, Ivan. Breeding buckwheat for increased

levels of rutin, quercetin and other bioactive compounds with potential antiviral effects. *Plants*. 2020, vol. 9, no. 12, str. 1-13 (1638). ISSN 2223-7747. https://doi.org/10.3390/plants9121638, DOI: 10.3390/plants9121638. [COBISS.SI-ID 40089347], [JCR, SNIP, WoS do 11. 2022: št. citatov (TC): 12, čistih citatov (CI): 12, čistih citatov na avtorja (CIAu): 1,33, Scopus do 22. 11. 2022: št. citatov (TC): 14, čistih citatov (CI): 14, čistih citatov na avtorja (CIAu): 1,56]

ISKANJE INFORMACIJ IN PRIPRAVA ČLANKOV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Iskanje informacij in priprava člankov
Course title:	Information searching and paper writing
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037247
Koda učne enote na članici/UL Member course code:	3749

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	15	20	0	0	80	5

Nosilec predmeta/Lecturer:	Tomaž Bartol

Izvajalci predavanj:	Tomaž Bartol
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
ISKANJE INFORMACIJ ISKALNE TEHNIKE: Učinkovita iskalna strategija (iskalni operatorji, iskalna polja, portali zbirk). SPECIALIZIRANE ZBIRKE: Bibliografske zbirke, zbirke doktorskih disertacij. CITATNE ZBIRKE: Web of Science, Scopus. Napredne iskalne tehnike, analitika objav/citatov (Kvartili in izračunavanje faktorja vpliva (IF), JCR,	INFORMATION SEARCHING SEARCH TECHNIQUES: Efficient search strategy (search operators, search fields, database interfaces) SPECIALIZED DATABASES: Bibliographic databases, dissertations databases CITATION DATABASES: Web of Science, Scopus. Advanced search techniques, citation analytics (Quartiles and Impact Factor (IF) , JCR, SNIP, SJR, H-index). Selecting journal for article submission.

SNIP, SJR, H-Index). Izbor revije za pošiljanje članka v objavo. DRUGE ZBIRKE: ISO Standardi, statistične informacije (EuroStat). SPLETNO ISKANJE ZNANSTVENIH VSEBIN: Google Scholar in napredne iskalne strategije, analitika in spletni faktor vpliva. SICRIS/COBISS/E-KNJIŽNICE: Slovenska znanstvena bibliografija, evalvacija objav po IF kvartilih in tipih dokumentov, merila raziskovalne uspešnosti (SICRIS), Digitalne knjižnice znanstvenih e-knjig Slovenije PISANJE ČLANKOV ZNANSTVENI JEZIK: Terminološki viri (e-geslovniki), Znanstvene okrajšave, slog znanstvenih besedil, samopreverjanje pisanja angleščine s spletnimi orodji. ZBIRANJE REFERENC: Generiranje osebne bibliografije, e-urejevalniki referenc (npr. Zotero, Mendeley). OBLIKOVANJE BESEDIL ZA OBJAVO: Znanstveni slog (IMRAD). Oblikovanje povoda, namena in omejitev raziskave. Strukturirani izvleček. Spremni dokumenti (naslovna stran, motivacijsko pismo uredniku).POŠILJANJE V OBJAVO: Sistemi za e-oddajo. Uredniški in recenzentski postopki. Arhiviranje člankov v spletnih repozitorijih. PREPOZNAVANJE SUMLJIVIH REVIJ IN ZALOŽNIKOV: Plenilske in lažne revije. Objave v odprtem dostopu. Avtorske pravice. NAMIGI IN TRIKI: Formatiranje in urejanje besedil. Uporaba predlog/stilov.	OTHER DATABASES: ISO standards, statistical information (EuroStat). SCIENTIFIC INFORMATION ON WWW Google Scholar and advanced search strategies, Web citation analytics. SICRIS/COBISS/E-LIBRARIES: Slovenian research bibliography, document types and research evaluation by IF (SICRIS), Digital libraries of scholary e-books Slovenia PAPER WRITING SCIENTIFIC LANGUAGE: Terminological resources (e-glossaries), Scientific acronyms and abbreviations, scientific style (emphasis on English language), self-assessment of writing using www tools. REFERENCE MANAGERS: Personal bibliography, reference managers (e.g. Zotero, Mendeley). PREPARING TEXTS FOR PUBLISHING: Scholary style (IMRAD). Formulating motivation, aims and limitations. Structured abstract. Separate documents (Title page, Cover letter, Highlights). ARTICLE SUBMISSION: Manuscript submission and editorial managers. Peer-review procedures. Article archiving and repositories. IDENTIFYING DECEPTIVE JOURNALS AND PUBLISHERS. Predatory and fake journals. Open Acssess publishing. TIPS AND TRICKS: Text formatting and editing. Using templates/styles.

Temeljna literatura in viri/Readings:

Cals, J., Kotz, D. (2021). *Scientific writing and publishing in medicine and health sciences: A quick guide in English and German*. De Gruyter. ISBN 978-1-4863-1144-4. https://doi.org/10.1515/9783110721621
Celotno besedilo dostopno prek DiKUL:
https://www.degruyter.com/document/doi/10.1515/9783110721621/html
Badenhorst, C., Guerin, C. (2015). *Research Literacies and Writing Pedagogies for Masters and Doctoral Writers*. Brill. ISBN 978-90-04-30433-8. Celotno besedilo dostopno prek DiKUL:
https://centaur.reading.ac.uk/53207/1/Furneaux%20in%20Guerin%20%26%20Badenhorst%202015%20Author%20final.pdf
Haider, J., & Sundin, O. (2019). *Invisible Search and Online Search Engines: The Ubiquity of Search in Everyday Life*. Routledge. ISBN 978-0-429-44854-6. https://doi.org/10.4324/9780429448546 Celotno besedilo dostopno prek DiKUL:
https://www.taylorfrancis.com/books/oa-mono/10.4324/9780429448546/invisible-search-online-search-engines-jutta-haider-olof-sundin
Lövei, G. (2021). *Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker*. Open Book Publishers. ISBN 978-1-80064-091-7 https://doi.org/10.11647/OBP.0235 Celotno besedilo dostopno prek DiKUL: https://books.openbookpublishers.com/10.11647/obp.0235.pdf
Bartol, T. *Iskanje informacij in priprava člankov : študijsko gradivo za študente interdisciplinarnega doktorskega študijskega programa Bioznanosti*. Ljubljana: Biotehniška fakulteta, Oddelek za agronomijo, 2022. https://e-pouk.bf.uni-lj.si/enrol/index.php?id=941. (dostop prek gesla) [COBISS.SI-ID 139221763] 1 optični disk (CD-ROM).
Revijalni članki s področja, tekoča periodika, druga učna gradiva v e-obliki

Cilji in kompetence:

Objectives and competences:

Predmet je namenjen predvsem študentom, ki na prejšnjih stopnjah niso poslušali informacijskih predmetov ali želijo ta znanja utrditi. Pridobljene kompetence so interdisciplinarne, praktične in prenosljive na različna raziskovalna področja. Cilj je usposobljen izbor strokovne terminologije, aplikacija terminologije pri poizvedbah z rabo naprednih iskalnih sintaks v različnih informacijskih sistemih (npr. citatnih, na spletu), ter kritična selekcija in vrednotenje pridobljenih dokumentov. Naslednja stopnja je sinteza informacij v lastni znanstveno strukturiran izdelek ter končna oddaja v objavo, upoštevajoč recenzentske zahteve uredništev in založnikov. Pri tem študentje spoznajo specifične elemente posameznih revij, orodja za oddajo ipd.	The course is aimed at students who have previously not attended information-related courses or wish to improve information competencies. The abilities acquired are interdisciplinary, practical and transferable to different research areas. The aim is the competent selection of specialist terminology, its application in search statements using advanced syntax in various information systems (e.g. citation databases and www) as well as the critical selection and evaluation of the documents thus found. The next step is the synthesis of the information into one's own scientifically structured paper and the final submission, taking into account peer-review requirements of editors and publishers. Students are familiarized with specific journal elements, editorial tools, etc.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent zna definirati informacijsko potrebo in specifične izraze sestaviti v kompetentno poizvedovalno strategijo v različnih sistemih. Pri tem razume različne ravni kompleksnosti v bibliografskih, citatnih in spletnih bazah podatkov. Zna ovrednotiti dela in razločevati med znanstveno preverjenimi in nepreverjenimi (sumljivimi, plenilskimi) praksami. Zna oblikovati lasten znanstveni sestavek in ga opremiti z elementi po specifičnih zahtevah posameznih revij (strukturirani izvleček, motivacijsko pismo uredniku, poudarki/highlights ipd.). Izve, kako se članek v objavo prek e-sistemov za oddajo in razume recenzentske postopke in zakonitosti odprtega dostopa oz. arhiviranja v repozitorijih.	Knowledge and understanding: Students are able to define an information need and combine specific terms into a competent search strategy in different systems. In doin so, they understand the different levels of complexity in bibliographic and citation databases as well as in web search engines. They are able to evaluate work and distinguish between scientifically validated and non-validated (deceptive and predatory) practises. They are able to write a research paper and provide the elements according to the specific requirements of a journal (structured abstract, cover letter, highlights etc.). They learn about e-submission and editorial managers and understand peer review processes and principles of Open Access and archiving in repositories.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, računalniške in praktične vaje, praktične naloge, individualne konzultacije, samostojno delo študentov	Lectures, practicals in a computer laboratory, coursework assignments, individual consultations, individual student work

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Praktični pisni bibliografski projekti	33,00 %	Practical bibliographic assignments
Ustni preizkus znanja	33,00 %	Oral examination
Seminar	34,00 %	Seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Bartol Tomaž

BARTOL, Tomaž. Smallholders and small-scale agriculture : Mapping and visualization of knowledge domains and research trends. *Cogent social sciences*. 2023, vol. 9, iss. 1, 2161778, 22 str. ISSN 2331-1886. DOI: 10.1080/23311886.2022.2161778. [COBISS.SI-ID 137842435], [SNIP, WoS, Scopus]

BARTOL, Tomaž, ČERNIČ ISTENIČ, Majda, STOPAR, Karmen, HOČEVAR, Marjan. Rural areas, rural population, and rural space in Central Europe (JCEA countries) : Research visualization in Scopus and Web of Science. *Journal of Central European Agriculture : JCEA*. [Online ed.]. 2022, vol. 23, no. 1, str. 246-260, ilustr. ISSN 1332-9049. DOI: 10.5513/JCEA01/23.1.3428. [COBISS.SI-ID 101189635], [SNIP, WoS, Scopus]
STOPAR, Karmen, TRDAN, Stanislav, BARTOL, Tomaž, ARTHUR, Frank H., ATHANASSIOU, Christos G. Research on stored products : A bibliometric analysis of the leading journal of the field for the years 1965–2020. *Journal of Stored Products Research*. [Print ed.]. 2022, vol. 98, art. 101980, 10 str. ISSN 0022-474X. DOI: 10.1016/j.jspr.2022.101980. [COBISS.SI-ID 112575491], [JCR, SNIP, WoS, Scopus]

HOČEVAR, Marjan, BARTOL, Tomaž. Mapping urban tourism issues : analysis of research perspectives through the lens of network visualization. *International journal of tourism cities*. 2021, vol. 7, no. 3, str. 818-844, ilustr. ISSN 2056-5607. DOI: 10.1108/IJTC-05-2020-0110. [COBISS.SI-ID 66662659], [SNIP, WoS]

STOPAR, Karmen, TRDAN, Stanislav, BARTOL, Tomaž. Thrips and natural enemies through text data mining and visualization. *Plant Protection Science*. 2021, vol. 57, no. 1, str. 47-58. ISSN 1212-2580. DOI: 10.17221/34/2020-PPS. [COBISS.SI-ID 41015043], [JCR, SNIP, WoS]

STOPAR, Karmen, MACKIEWICZ-TALARCZYK, Maria, BARTOL, Tomaž. Cotton fiber in Web of Science and Scopus : Mapping and visualization of research topics and publishing patterns. *Journal of natural fibers*. 2021, vol. 18, no. 4, str. 547-558. ISSN 1544-0478. DOI: 10.1080/15440478.2019.1636742. [COBISS.SI-ID 9267065], [JCR, SNIP, WoS]

STOPAR, Karmen, BARTOL, Tomaž. Digital competences, computer skills and information literacy in secondary education: mapping and visualization of trends and concepts. *Scientometrics*. 2019, vol. 118, iss. 2, str. 479-498. ISSN 0138-9130. DOI: 10.1007/s11192-018-2990-5. [JCR, SNIP, WoS]

BARTOL, Tomaž, DOLNIČAR, Danica, BOH PODGORNIK, Bojana, RODIČ, Blaž, ZORANOVIĆ, Tihomir. A comparative study of information literacy skill performance of students in agricultural sciences. *Journal of academic librarianship*. [Print ed.]. 2018, iss. 3, vol. 44, str. 374-382. ISSN 0099-1333. DOI: 10.1016/j.acalib.2018.03.004. [COBISS.SI-ID 1397854], [JCR, SNIP, WoS]

IZBIRNI PREDMETI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbirni predmeti
Course title:	Elective Subjects
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	1. letnik	Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0040206
Koda učne enote na članici/UL Member course code:	0000

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
					750	30

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references:

IZBIRNI PREDMETI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbirni predmeti
Course title:	Elective Subjects
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	2. letnik	Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0040213
Koda učne enote na članici/UL Member course code:	0000

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
					375	15

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references:

IZBRANA POGLAVJA IZ PRIDELOVANJA VRTNIN

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbrana poglavja iz pridelovanja vrtnin
Course title:	Selected topics of vegetable production
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037304
Koda učne enote na članici/UL Member course code:	3806

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	10	10	0	0	95	5

Nosilec predmeta/Lecturer:	Nina Kacjan Maršić

Izvajalci predavanj:	Nina Kacjan Maršić
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	Basic preconditions for doctoral studies

Vsebina:	Content (Syllabus outline):
Okoljski dejavniki kot spodbujevalci biokemijskih sprememb v pridelkih vrtnin (vodni režim, osvetlitev, toplota); hranilni stres za strimulacijo bioaktivnih snovi v pridelku vrtnin; pomen biostimulantov pri pridelavi vrtnin in njihov vpliv na kakovost pridelka; sodobne tehnologije pridelave pri posameznih vrstah zelenjadnic; izbor različnih tehnik (hidroponika, cepljenje vrtnin);	Environmental factors as eliciters of biochemical changes in vegetqble crops (water regime, lighting, temperature); nutrient stress as a factor that stimulates biosynthesis of bioactive compounds in vegetable crops; selection of different cultivation techniques (hydroponic, vegetable grafting) and technological tools (nutrition, fertigation, protection) and their impacts on quality parameters of vegetable crops;

načini spravila pridelka ter vpliv na ohranjanje kakovosti pridelka vrtnin. Priprava, predstavitev in pogovor na temo seminarske naloge, povezano z vsebino predmeta.	harvesting methods for individual vegetable crops and impact on postharvest crop traits. Preparation, presentation and discussion of the seminar work, related to the course.

Temeljna literatura in viri/Readings:

Kozai, T., Niu, G., & Takagaki, M. (Eds.). (2019). Plant factory: an indoor vertical farming system for efficient quality food production. Academic press. ISBN:978-0-12-816694-8.
Ortiz-Urquiza, A. (2022). Improving integrated pest management in horticulture Rosemary Collier (ed.) 486 pp.£ 150.00. ISBN-13: 9781786767530 (hardback). Burleigh Dodds Science Publishing Limited: Sawston, Cambridge, UK, 2022.
Aktualni znanstveni članki na področju pridelave vrtnin
Bulgari R., Franzoni G., Ferrante A. 2019. Biostimulants application in horticultural crops under abiotic stress conditions. Agronomy, 9, 306, https://doi.org/10.3390/agronomy9060306
Du Jardin, P. (2015). Plant biostimulants: Definition, concept, main categories and regulation. Scientia horticulturae, 196, 3-14.
Mangal, V., Lal, M. K., Tiwari, R. K., Altaf, M. A., Sood, S., Gahlaut, V., Kumar, D. 2023. A comprehensive and conceptual overview of omics-based approaches for enhancing the resilience of vegetable crops against abiotic stresses. Planta, 257(4), 80.
Sharma, D., Shree, B., Kumar, S., Kumar, V., Sharma, S., & Sharma, S. (2022). Stress induced production of plant secondary metabolites in vegetables: Functional approach for designing next generation super foods. *Plant Physiology and Biochemistry*.

Cilji in kompetence:	**Objectives and competences:**
Dokazano je, da je kakovost vrtnin in z njo povezane snovi v pridelku odvisni od okoljskih razmer ter od tehnologij gojenja. Cilj predmeta je poglobitev znanja s področja gojenja izbranih vrtnin s poudarkom na odzivu in prilagajanju rastlin na spremembe okoljskih dejavnikov in tehnologij gojenja Kompetence: študenti s poznavanjem odzivov vrtnin na spremembe delovanja okoljskih dejavnikov s sintezo različnih bioaktivnih snovi lažje razumejo povezave med hranilno vrednostjo vrtnine, sorto, rastnimi razmerami in tehniko gojenja in bodo to znanje lahko uporabili za znanstveno in raziskovalno delo.	The relationship between environmental conditions and chemical characteristics of vegetable crops has already been confirmed. The goal of the course is to acquire advanced knowledge on vegetable crop production and the adaptation of different vegetable species on alleviation of environmental conditions and technologies. According to the knowledge about vegetable production and plants adaptation on alleviation of different environmental conditions, students will recognize the relationships between crop quality parameters, cultivars, cultivation methods and environmental conditions. They can use this knowledge in their future scientific and research work.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študentje poglobijo in osvojijo potrebna znanja za spoznavanje odziva izbranih vrtnin na okoljske spremembe ter na različne tehnologije pridelovanja. Usposobitev študenta za samostojno raziskovalno delo pri proučevanju vplivov okoljskih dejavnikov in tehnologij gojenja na rast in razvoj gojenih rastlin ter na spremembe kakovostnih parametrov pridelanih vrtnin. *Uporaba:* Študent pridobi med študijem dovolj informacij za samostojno raziskovalno delo na področju pridelovanja vrtnin in odziva gojenjih vrtnin na spremembe okoljskih ter rastnih dejavnikov.	*Knowledge and understanding:* Students attain and upgrade knowledge on successful recognition of vegetable response on various environmental conditions and different cultivation techniques. Students are qualified for individual research work on evaluation of impacts of different environmental conditions and cultivation methods on vegetable growth and development as well as on quality parameters of vegetable crops. *Use:* The ability to use the knowledge for individual research work on vegetable production and on vegetable response to environmental conditions and growing factors.

Refleksija: testiranje pridobljenega znanja pri praktičnem raziskovalnem delu ter uporaba pridobljenih znanj in primerjava tuje literature pri oblikovanju znanstvenega dela. *Prenosljive spretnosti:* Prenos – poročanje o pridobljenem znanju (lastno znanje, zbrani podatki iz strokovne in znanstvene literature) pisno (v obliki seminarja) ter ustno na predstavitvi seminarja.	*Reflections:* Application of the acquired knowledge in practical research and comparison of international literature data in order to develop the skill to write scientific articles. *Transferable skills*: Transfer and reports of obtained knowledge (self-acquired knowledge, abstracts from the professional and scientific literature) in written (seminar) and oral reports.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, izdelava seminarskih nalog, ogled tehnologij gojenja vrtnin na terenu.	Lectures, seminar work, Field excursions (different vegetable production technologies)

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar	50,00 %	Written seminar work
Zagovor seminarja	50,00 %	Oral presentation of the seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

1. KOVAČIČ, Ana, ANDREASIDOU, Eirini, BRUS, Anže, VEHAR, Anja, POTOČNIK, Doris, JAGODIC HUDOBIVNIK, Marta, HEATH, David John, PINTAR, Marina, **KACJAN-MARŠIĆ, Nina**, OGRINC, Nives, BLAZNIK, Urška, HEATH, Ester. Contaminant uptake in wastewater irrigated tomatoes. Journal of Hazardous Materials. [Online ed.]. Apr. 2023, vol. 448, [article no.] 130964, str. 1-11, ilustr. https://www.sciencedirect.com/science/article/pii/S0304389423002467?via%3Dihub, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=148643, DOI: 10.1016/j.jhazmat.2023.130964. [COBISS.SI-ID 141167619]
2. MAVRIČ ČERMELJ, Anja, FIDERŠEK, Eva, GOLOB, Aleksandra, **KACJAN-MARŠIĆ, Nina,** VOGEL-MIKUŠ, Katarina, GERM, Mateja. Different concentrations of potassium silicate in nutrient solution affects selected growth characteristics and mineral composition of barley (Hordeum vulgare L.). Plants. Jun. 2022, vol. 11, iss. 11, str. [1]-12, ilustr. ISSN 2223-7747. https://doi.org/10.3390/plants11111405, DOI: 10.3390/plants11111405. [COBISS.SI-ID 109480707]
3. **KACJAN-MARŠIĆ, Nina,** ŠTOLFA, Petra, VODNIK, Dominik, KOŠMELJ, Katarina, MIKULIČ PETKOVŠEK, Maja, KUMP, Bojka, VIDRIH, Rajko, KOKALJ SINKOVIČ, Doris, PISKERNIK, Saša, FERJANČIČ, Blaž, DRAGUTINOVIĆ, Maja, VEBERIČ, Robert, HUDINA, Metka, ŠIRCELJ, Helena. Physiological and biochemical responses of ungrafted and grafted bell pepper plants (Capsicum annuum L. var. grossum (L.) Sendtn.) grown under moderate salt stress. Plants. 2021, vol. 10, no. 2, str. 1-19 (314). ISSN 2223-7747. https://www.mdpi.com/2223-7747/10/2/314/htm, DOI: 10.3390/plants10020314. [COBISS.SI-ID 50629891]
4. KACJAN-MARŠIĆ, Nina, SINKOVIČ MOŽE, Ksenija, MIHELIČ, Rok, NEČEMER, Marijan, HUDINA, Metka, JAKOPIČ, Jerneja. Nitrogen and sulphur fertilisation for marketable yields of cabbage (Brassica oleracea L. var. capitata), leaf nitrate and glucosinolates and nitrogen losses studied in a field experiment in central Slovenia. Plants. 2021, vol. 10, no. 7 (1304), str. 1-16, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/10/7/1304, DOI: 10.3390/ plants10071304. [COBISS.SI-ID 68288771]
5. GERM, Mateja**, KACJAN-MARŠIĆ, Nina,** KROFLIČ, Ana, JERŠE, Ana, STIBILJ, Vekoslava, 5. JERŠE, Ana, KACJAN-MARŠIĆ, Nina, KROFLIČ, Ana, GERM, Mateja, ŠIRCELJ, Helena, STIBILJ, Vekoslava. Is foliar enrichment of pea plants with iodine and selenium appropriate for production of functional food?. Food chemistry. [Print ed.]. 2018, vol. 267, str. 368-375, ilustr. ISSN 0308-8146. https://www.sciencedirect.com/science/article/pii/S0308814618303509?via%3Dihub, DOI: 10.1016/j.foodchem.2018.02.112. [COBISS.SI-ID 8939897]
6. **KACJAN-MARŠIĆ, Nina**, VODNIK, Dominik, MIKULIČ PETKOVŠEK, Maja, VEBERIČ, Robert, ŠIRCELJ, Helena. Photosynthetic traits of plants and the biochemical profile of tomato fruits are influenced

by grafting, salinity stress and growing season. Journal of agricultural and food chemistry. 2018, vol. 66, no. 22, str. 5439-5450. ISSN 0021-8561. DOI: 10.1021/acs.jafc.8b00169. [COBISS.SI-ID 8978041]

IZBRANA POGLAVJA IZ REJE ŽIVALI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbrana poglavja iz reje živali
Course title:	Advanced animal husbandy
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037348
Koda učne enote na članici/UL Member course code:	3851

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	15	0	0	5	95	5

Nosilec predmeta/Lecturer:	Dušan Terčič

Izvajalci predavanj:	Dušan Terčič
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Predmet obsega večino vsebin s področij reje živali in njihovih proizvodov. Študenti bodo pridobili poglobljena znanja na področjih, ki so zanje še posebej zanimiva in lahko med drugim vključujejo tudi: - različne vrste in proizvodne tipe domačih živali ter znanstvena spoznanja, na katerih temelji reja le teh; - intenzivne in ekstenzivne sisteme rej, primerne za različne vrste domačih živali;	The course will cover most aspects of animal production and animal products. It will provide students with depth of knowledge in their focused area of study, which may include: - the different species and production types of domestic animals and the science that underpins managing animals as farm animals; - intensive and extensive systems of production appropriate to a range of livestock species;

- načine vrednotenja proizvodnih lastnosti in lastnosti zunanjosti pri govedu, perutnini in prašičih; - uporabo izsledkov raziskav za izboljšanje počutja živali; - varno in humano prirejo različnih proizvodov živalskega porekla; - poznavanje dejavnikov, ki vplivajo na kakovost proizvodov živalskega porekla in odnos porabnikov do parametrov, ki opredeljujejo to kakovost; - sheme kakovosti, ki omogočajo zaščito proizvodov živalskega porekla; - genetske/genomske principe in metode izboljševanja domačih živali ter uvajanje genomske selekcije v nacionalne črede/jate/trope.	- techniques associated with exterier and performance evaluation of beef, dairy, poultry, and swine; - application of research findings for the improvement of animal welfare; - the safe and humane production of products derived from different livestock species; - factors affecting quality of animal products and consumer attitudes to parameters defining quality of these products; - quality schemes enabling the protection of products of animal origin; - genetic/genomic principles and methods to the improvement of livestock and poultry and application of the genomic selection in the national herd.

Temeljna literatura in viri/Readings:

Aland A., Banhazi T. 2013. Livestock housing: Modern management to ensure optimal health and welfare of farm animals. 496 str. ISBN: 978-90-8686-217-7

Engelhard M., Hagen K., Boysen M. 2008. Genetic Engineering in Livestock. New Applications and Interdisciplinary Perspectives. 1. izdaja. Springer-Verlag Berlin Heidelberg, 146 str. ISBN 3-540-85842-3; 3-642-09937-8; 3-540-85843-1

Fuller M. F., editor. 2004. The encyclopedia of farm animal nutrition. Wallingford : CABI Oublishing is a division of CAB International, 606 str. ISBN : 9780851999500

Knight A., Phillips C., Sparks P. 2022. Routledge Handbook of Animal Welfare. 1. izdaja. Routledge, Taylor and Francis, 534 str. https://doi.org/10.4324/9781003182351

Shapiro L. 2000. Introduction to Animal Science. Upper Saddle River, N.J.: Prentice Hall, 578 str. ISBN: 0-13-920992-1 9780139209925 (10)

Yücel B., Taşkin T. 2018. Animal Husbandry and Nutrition. IntechOpen, 200 str. http://dx.doi.org/10.5772/intechopen.69938

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilj predmeta je, da študenti pridobijo dodatna, poglobljena znanja na področjih temeljnih živinorejskih ved in sicer reje, reprodukcije, prehrane, rasti in razvoja, zdravstvenega varstva, uhlevitve, rokovanja ter varnosti in kakovosti proizvodov živalskega porekla. V času izvajanja predmeta bodo imeli možnost, da se intenzivneje posvetijo področju, ki jih še posebej zanima.	The objective of the course is to provide students with more advanced, deep knowledge in areas of basic animal science disciplines, namely animal breeding, reproduction, feeding, growth and development, health management, housing, handling, and end - product safety and quality. Throughout the course students will have increasing opportunity to explore specific areas of their own interest.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Na koncu izvajanja predmeta bodo študenti usposobljeni za: - Povezovanje znanj in veščin, ki so potrebne za učinkovito gospodarjenje z domačimi živalmi na način, ki kar najbolje spaja dobro počutje živali z zahtevami sodobnih proizvodnih sistemov. - Razumevanje pomena načina uhlevitve, genetike, fiziologije, prehrane, zdravstvenega varstva in ostalih dejavnikov na učinkovitost in kakovost živalske prireje. - Jasno in kritično presojanje ter učinkovito ukrepanje ob pojavu težav v reji, ne glede na okoliščine v katerih so se znašli.	Knowledge and understanding: At the end of the module students will be able to: - Integrate the knowledge and skills required to efficiently manage farm animals in a way that integrates animal welfare with modern and demanding production requirements. - Recognize the importance of housing system, genetics, physiology, nutrition, health, and other factors that contribute to the efficiency and quality of animal production. - Think clearly and critically about farm management issues and problems, and make appropriate decisions in a variety of situations. - Conduct innovative research that advances scientific knowledge gained in due course.

- Samostojno izvedbo inovativne raziskave, ki bo prispevala k znanju, pridobljenem v času izvajanja predmeta.	

Metode poučevanja in učenja:	**Learning and teaching methods:**
- predavanja; - konzultacije; - samostojno seminarsko delo.	- lectures; - consultations; - seminar work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pozitivna ocena seminarja je predpogoj za pristop k pisnemu izpitu. Zaključna ocena je tehtana aritmetična sredina: 1. pozitivno opravljenega seminarja	30,00 %	A passing grade of the seminar is a prerequisite for taking the written exam. Final grade is weighted arithmetic mean of: 1. positive evaluated seminar
2. pozitivno opravljenega izpita.	70,00 %	2. positive evaluated written exam.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Dušan Terčič

1. ERJAVEC, Karmen, JANŽEKOVIČ, Marjan, KOVAČ, Milena, SIMČIČ, Mojca, MERGEDUŠ, Andrej, **TERČIČ, Dušan**, KLOPČIČ, Marija. Changes in use of communication channels by livestock farmers during the COVID-19 pandemic. *Sustainability*. 2021, vol. 13, no. 18, str. 1-14, ilustr. ISSN 2071-1050. https://www.mdpi.com/2071-1050/13/18/10064, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=136137, DOI: 10.3390/su131810064

2. TERČIČ, Dušan, PANČUR, Mojca, JORDAN, Dušanka, ZUPAN, Manja. Effects of dimethyl anthranilate-based repellents on behavior, plumage condition, egg quality, and performance in laying hens. *Frontiers in veterinary science*. 2020, vol. 7, art. no. 533, str. 1-13, DOI: 10.3389/fvets.2020.00533.

3. CIVIDINI, Angela, **TERČIČ, Dušan**, SIMČIČ, Mojca. The effect of feeding system on the carcass quality of crossbred lambs with Texel. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*. 2020, vol. 68, no. 1, str. 17-24, DOI: 10.11118/actaun202068010017.

4. TERČIČ, Dušan, OMEJEC, Sandra, POGOREVC, Neža, DOVČ, Peter, KUNEJ, Tanja. Protocol for development of the chicken miRegulome - an integrative map of microRNA regulatory networks = Protokoll für die Entwicklung des Hühner-miReguloms - eine integrative Karte des MicroRNA regulatorischen Netzwerkes. *Archiv für Geflügelkunde = : European poultry science (Internet)*. 2019, vol. 83, str. 1-21, DOI: 10.1399/eps.2019.258.

5. TERČIČ, Dušan, PANČUR, Mojca. Effects of flock age, prestorage heating of eggs, egg position during storage and storage duration on hatchability parameters in layer parent stock. V: DOVČ, Peter (ur.). *Technology driven animal production*. 24th International Symposium Animal Science Days, Ptuj, September 21st-23rd, 2016. Ljubljana: Biotechnical Faculty, 2016. Suppl. 5, str. 138-142. Acta agriculturae slovenica, Supplement, 2016, 5. ISBN 978-961-6379-36-6. ISSN 1854-4800.

6. ZORC, Minja, OMEJEC, Sandra, **TERČIČ, Dušan**, HOLCMAN, Antonija, DOVČ, Peter, KUNEJ, Tanja. Catalog of genetic variants within mature microRNA seed regions in chicken. *Poultry science*. 2015, vol. 94, no. 9, str. 2037-2040, DOI: 10.3382/ps/pev170.

IZBRANA POGLAVJA IZ TEORIJE OBLIKOVANJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbrana poglavja iz teorije oblikovanja
Course title:	Selected chapters from the theory of design
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037310
Koda učne enote na članici/UL Member course code:	3812

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	40	0	0	0	190	10

Nosilec predmeta/Lecturer:	Ana Kučan

Izvajalci predavanj:	Ana Kučan
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
splošni pogoji za vpis na doktorski študij	General conditions for enrollment in doctoral study

Vsebina:	Content (Syllabus outline):
Predmet predstavi teorijo kot interpretacijo, kot normativno osnovo oblikovanja in kot pisno spremljavo zgodovinske tvornosti. Obravnava naravo oblikovalne teorije in njeno utemeljenost v krajinsko-arhitekturni praksi. Predstavi in razloži pojmovne kategorije v teoriji krajinske oblike. Ontološki in epistemološki vidik. Likovne prvine. Predmet teorije: krajina kot artefakt. Teorijo krajinskega oblikovanja in oblikovanje krajin postavi v	Theory as interpretation, as a normative base for design and as a written companion of arts in historical chronology. Nature of design theory and its justification in the practice of landscape architecture. Conceptual categories in the theory of landscape form. Ontological and epistemological perspective. Formal elements. Object of theory: landscape as an artifact. Theory of landscape design and landscape design in the context

kontekst drugih oblikovalskih disciplin, zlasti sorodnih vizualnih disciplin in izpostavi skupne in diferencialne poteze. Analizira sodobna gibanja, jih primerja s preteklim repertoarjem in problematizira njihovo teoretsko nedomišljenost. Krajina kot artefakt predmet umetnostnozgodivnskih študij in predmet kritike. Krajinska arhitektura kot ena od vej umetnosti, kamor sodijo slikarstvo, oblikovanje, arhitektura... Definicija umetnostne kritike. Osnovni pojmi umetnostne kritike, pregled kritiških tradicij, kritika arhitekture, vidiki kritike. Specifičnosti krajinskoarhitekturne kritike, njene naloge in vidiki. Razlike med kritiko, zgodovino in teorijo.	of other design professions, especially architecture and design. Exposing commonalities and differences. Analysis of contemporary movements and trends, comparison to the past repertoire and problematisation of the lack of the theoretical thought. Landscape as an artifact as an object of art historical studies and an object of a critique. Landscape architecture as one of the fields of Arts, such as painting, design, architecture.... Definition of art critique. Basic concepts of art critique, overview of the tradition of the critical thought, the critique of architecture, aspects of the critique. Specifics of the critique in landscape architecture. Diferences between the critique, art-history and theory.

Temeljna literatura in viri/Readings:

Kučan, Ana, Kurir, Mateja, ur.: Vrt in prispodoba. Ljubljana: Biotehniška fakulteta in MAO, 2021. ISBN - 978-961-6669-75-7. [COBISS.SI-ID 75236611]
Kučan, Ana, Kurir, Mateja, ur.: Garden and Metaphor. Basel: Birkähuser, 2024. ISBN - 978-3-0356-2655-1. [COBISS.SI-ID 172849667]
revijalni članki s področja, tekoča periodika, druga učna gradiva

Cilji in kompetence:	**Objectives and competences:**
Cilj je usposabljanje študentov za razumevanje pomena in načinov generiranja oblike v procesu oblikovanja krajine. Razumevanje konceptov in teorij krajinskega oblikovanja. Sposobnost hierarhiziranja in reflektiranja (problemov, procesa, namenov, rezultatov). Sposobnost določanja vizij in mišljenja poti za njihovo doseganje.	- to make students comprehend the role and ways of generationg landscape form in the process of landscape design. - to obtain knowledge about concepts and theories of landscape design and about critique -to be able to determine the hierarchy of and to reflect on (problems, process, objectives, results) To be able to develop visons and think the ways of their for implementation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje procesov in trendov oblikovanja v krajinski arhitekturi, poznavanje metod in glavnih pristopov k oblikovanju, razumeva je nastanka /generiranja / oblike iz funkcije, konteksta – prostorskega in družbenega, zgodovinske podlage in (smibolnega) pomena; izgradnja arghumentacije; sposobnos evalvacije / kritike na podlagi prej izpostavljenih vidikov (funkcija, umestitev v kontekst, problem, sporočilnost itd.) *Uporaba:* refleksija in evalvacija del in procesa oblikovanja v arhitekturi in krajinski arhitekturi *Refleksija:* smiselno razbiranje formalnega jezika v arhitekturi in krajinski arhitekturi *Prenosljive spretnosti*: sposobnost ocenjevanja / kritičnega pogleda na lastno ustvarjalnost in ustrvarjalnost drugih *Znanje in razumevanje*: Razumevanje oblikovane krajine kot artefakta, poznavanje glavnih teoretskih izhodišč krajinskega oblikovanja, poznavanje kritiških	*Knowledge and understanding*: of processes and trends of design in landscape architecture of methods and approaches to design, of form generation out of function, context, historical threads and (symbolic) meaning of methods of argumentation, contextualization and understanding of formal expressions *Application*: Reflection and evaluation of design process in landscape architecture *Reflection:* meaningful reading of formal language *Transferable skills*: complex thinking and developed ability to critically reflect one's own work and the works of the others *Knowledge and understanding*: Understanding designed landscape as an artefact; knowledge of theoretical bases of landscape design, of approaches in architectural critique and evaluation of a landscape artefact as a work of art. *Application*:

pristopov in vidikov evalvacije krajinskoarhitekturnega dela kot artefkta oziroma umetniškega dela. *Uporaba:* razvoj teorije kritike; pisanje kritik na strokovni in poljudni ravni; ozaveščanje strokovne in laične javnosti o pomenu krajinskoarhitekturnega dela *Refleksija:* veljavnosti strokovnih znanj in vrednostnih sistemov pri vrednotenju krajinskoarhitekturnega dela kot umetniškega artefakta, znotraj strokovnih in širših družbenokulturnih okvirov. *Prenosljive spretnosti*: razumevanje delovanja in artefaktov kot rezultatov; konceptualizacija oblikovalskega problema v krajinski arhitekturi in alternativ v krajinskem oblikovanju.	in development of the theory of critique, in critical writing for professional and lay public, raising awareness of the meaning of a designed landscape in both *Reflection:* the importance of professional knowledge in value systems in evaluation of a landscape artefact as a work of art, within professional and within broader cultural and social aspects. *Transferable skills*: understanding of the design process and of the artefacts as the result of this process; conceptualization of design problem in landscape architecture and alternatives in landscape design

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, delo v skupini, analiza primerov, razprave, individualne seminarske naloge s konzultacijami, predstavitev naloge z zagovorom.	Lectures, group discussions, case studies, individual seminar work with consultation presentation and discussion of the final paper (a critique)..

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminarska naloga	60,00 %	Final paper
predstavitev in zagovor seminarske naloge	40,00 %	Presentation and discussion on the paper

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Ana Kučan:

1. KUČAN, Ana. Najprej je bil vrt. V: KUČAN, Ana (ur.), KURIR, Mateja (ur.), *Vrt in prispodoba* . Ljubljana: Biotehniška fakulteta, in Muzej za arhitekturo in oblikovanje; cop. 2021, str. 18-36. [COBISS.SI-ID 89136643]
2. KUČAN, Ana (ur.), KURIR, Mateja *Vrt in prispodoba* . Ljubljana: Muzej za arhitekturo in oblikovanje in Biotehniška fakulteta; cop. 2021. [COBISS.SI-ID - 75236611]
3. KUČAN, Ana. Vrtovi kot konstrukcije prostora. V: ORSENNA, Érik *Portret srečnega človeka: Andreé Le Nôtre 1613 – 1700* . Ljubljana: Založba /*cf.; cop. 2016, str. 143-171. [COBISS.SI-ID - 287289088]
4. KUČAN, Ana. The power of discrete change. V: GESSEL, Michael van (ur.), DIEDRICH, Lisa (ur.). *In touch : [landscape architecture Europe]*. Basel: Birkhäuser; Wageningen: Blauwdruk, cop. 2012, str. 175-178. [COBISS.SI-ID 7387257]
5. DIEDRICH, Lisa, HUBERTUS, Adam, HENDRIKS, Mark, KUČAN, Ana, ur.: On Site : Landscape Architecture Europe. Basel; Boston; Berlin: Birkhäuser, cop. 2009. 261 str., ilustr. ISBN 978-3-7643-8950- [COBISS.SI-ID 6074233]
6. KUČAN, Ana. Playscape - in defence of public space. V: On Site : Landscape Architecture Europe. Basel; Boston; Berlin: Birkhäuser, cop. 2009, str. 132-135, ilustr. [COBISS.SI-ID 6074489]
7. KUČAN, Ana, ROBBINS, Edward, SKANSI, Luka. *Vsi odtenki zelene = All shades of green.* 1. izd. Ljubljana: Muzej in galerije mesta: = Museum and Galleries, 2010. 255 str., fotogr. ISBN 978-961-6509-24-4. [COBISS.SI-ID 251855104].
8. KUČAN, Ana. Novo in staro - načrtovalske dileme pri prenovi zgodovinskih parkov in vrtov. V: BRIŠNIK, Danijela (ur.), et al. *Vrtna arhitektura 1 stoletja v srednji Evropi : raziskovanje, rekonstruiranje, ohranjanje : zbornik mednarodnega simpozija, dvorec Dornava 2011 = Gartenarchitektur des 18. Jahrunderts in Mitteleuropa : Erforschung, Rekonstruktion, Erhaltung : Sammelband des internationalen Symposiums, Schloss Dornava 2011*. Ljubljana: Slovensko konservatorsko društvo, 2013, str. 120-129. [COBISS.SI-ID 7850361]
9. KUČAN, Ana, ZAPUŠEK ČERNE, Andreja. Re-invention of public space. *Topos*, ISSN 0942-752X, 2012, vol. 81, str. 70-76. [COBISS.SI-ID 7386489]

IZBRANA POGLAVJA IZ VINOGRADNIŠTVA IN TRSNIČARSTVA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbrana poglavja iz vinogradništva in trsničarstva
Course title:	Selected topics in viticulture and nursery
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037305
Koda učne enote na članici/UL Member course code:	3807

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	30	0	0	5	80	5

Nosilec predmeta/Lecturer:	Denis Rusjan

Izvajalci predavanj:	Denis Rusjan
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	Basic preconditions for doctoral studies.

Vsebina:	Content (Syllabus outline):
Prilagajanje sortne agro-ampelotehnike na spreminjajoče se zahteve po tehnološki zrelosti grozdja, upoštevajoč okoljske razmere oziroma absolutne vinogradniške lege. Odbira in izbira optimalnih podlag, sort trte (klonov) in načinov gojenja (klasična, integrirana in biološka pridelava), kjer se bo seznanil z vidiki onesnaževanja teh pridelav, predvsem vpliva na vnos težkih in prehodnih kovin v vinogradna tla. Opredelitev	Specific use of several agro-ampelotechnical measures adapted to different cultivars and technological ripeness of the grapes in regard to environmental conditions or optimal vineyard position. Selection and choice of vine rootstocks, cultivars (clones) and cultivation methods (conventional, integrated and organic agriculture) with special emphasis on environmental pollution of each production type, particularly the accumulation of heavy and

kakovosti grozdja kot orodja, ki vpliva na kakovost vina in senzorični management. V vsebino predmeta bo vključena tudi pridelava namiznega grozdja, kjer bo študent spoznal novosti in specifiko tehnologije pridelave in trenutno zakonodajo ter možnosti take pridelave v Sloveniji. V okviru trsničarstva se bo seznanil z novostmi tehnologije pridelave cepljenk, možnostmi cepljenja in z nego vložišča od spomladi do jeseni ter selekcijami trte. Spoznal bo pomen izbora in lastnosti posameznih podlag in njihovo uporabo za blaženje negativnih vplivov okoljskih razmer, kot tudi o pomenu virusnih in ostalih bolezni na pridelavo cepljenk ter možnosti preprečevanja okužb in širjenja bolezni in škodljivcev s cepljenkami. Tako bo študent pridobil znanje o biodiverziteti vrst, sort in klonov trte, možnosti njihovih prilagajanj na spreminjajoče okoljske razmere. Podani bodo vplivi parametrov lege na rast, rodnost trte in kakovost grozdja ter potenciali posameznih vinogradniških praks za blaženje negativnih in izkoriščanje pozitivnih vplivov okolja. Opredeljena bo kakovost grozdja s strani primarnih in sekundarnih metabolitov in kako do take kakovosti pridemo.	transitional metals into vineyard soils. The definition of grape quality and its effect on the quality of wine and sensory management. The course content will also include the knowledge on specific measures for cultivation of table grapes: innovations, technologies, current legislation and the possibility of production in Slovenia. From the field of grapevine nursery students will be acquainted with the newest production technologies of grafted vines, new grapevine selection, grafting process and maintenance of stock/grafted plants from spring to autumn. The student will understand the importance of optimal selection of rootstock as these can mitigate the negative effects of environmental conditions. The significance of viral and other diseases on the production of grafted plants will be discussed along with the measures for infection prevention and the spread of diseases and pests from plant to plant. Thus, the student will acquire knowledge of the biodiversity of species, cultivars and clones and the possibility of their adaptation to changing environmental conditions. The site parameters affecting growth, yield and grape quality will be presented and the potential of vineyard practices to moderate the negative and exploit the positive effects of the environment explained. Internal grape quality will be defined as the content of specific primary and secondary metabolites. Technological measures to produce optimal quality grape will be stated.

Temeljna literatura in viri/Readings:

1.) Fregoni M. 2005. Viticoltura di qualita. Verona, Phytoline: 810 str.
2.) Smart, R. E., Robinson, M. D. 1991. Sunlight into Wine: A Handbook for Winegrape Canopy Management. Adelaide, Winetitles: 88 str.
3.) James E. Wilson. 2012. Terroir: The Role of Geology, Climate, and Culture in the Making of French Wines. Wine Appreciation Guild: 336 str.
4.) Hernâni Gerós, Maria Manuela Chaves, Hipolito Medrano Gil, Serge Delrot. 2015. Grapevine in a Changing Environment: A Molecular and Ecophysiological Perspective. Wiley-Blackwell: 400 str.
5.) znanstveni in strokovni članki z aktualnimi vsebinami

Cilji in kompetence:	**Objectives and competences:**
Cilji predmeta so poznavanje in razumevanje razmnoževanja, rasti in rodnosti vinske trte ter kakovosti grozdja vključujoč neposredne interakcije med agro-ampelotehniko in lego. Spoznavanje in ločevanje tehnologij, vrste, sorte in klone ter podlage vinske trte in vinogradniške prakse pridelave vinskega in namiznega grozdja.	The objectives of the course are knowledge and understanding of grapevine reproduction, growth and fertility and grape quality including direct interactions between agro-ampelotechnic practices and location. Understanding and separation of technologies, grapevine species, varieties, clones and rootstocks, moreover production practices of wine and table grapes.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in prilagaja tehnološke prakse upoštevajoč lego, sorto in spreminjajoče okoljske razmere.	Knowledge and understanding: The student understands and adjusts technological measures to different sites, cultivars and changing environmental conditions.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja, seminarji, terensko delo in laboratorijsko delo vezano na temo doktorske disertacije.	Lectures, seminar work, field work and laboratory work adapted to the field of doctoral thesis.

Načini ocenjevanja:	Delež/Weight	Assessment:
Pozitivno opravljena seminarska naloga.	40,00 %	Seminar work.
Pozitivno opravljen izpit.	60,00 %	Exam.

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

1. RUSJAN, Denis, PERŠIĆ, Martina, LIKAR, Matevž, BINIARI, Katerina, MIKULIČ PETKOVŠEK, Maja. Phenolic responses to esca-associated fungi in differently decayed grapevine woods from different trunk parts of 'Cabernet Sauvignon'. Journal of agricultural and food chemistry. 2017, vol. 65, iss. 31, str. 6615-6624. ISSN 0021-8561. DOI: 10.1021/acs.jafc.7b02188. [COBISS.SI-ID 8754553]
2. RUSJAN, Denis, MIKULIČ PETKOVŠEK, Maja. Double Maturation Raisonnée: the impact of on-vine berry dehydration on the berry and wine composition of Merlot (Vitis vinifera L.). Journal of the science of food and agriculture. [Print ed.]. 2017, vol. 97, iss. 14, str. 4835-4846. ISSN 0022-5142. http://dx.doi.org/10.1002/jsfa.8354, DOI: 10.1002/jsfa.8354. [COBISS.SI-ID 8711033]
3. MIKULIČ PETKOVŠEK, Maja, ŠKVARČ, Andreja, RUSJAN, Denis. Biochemical composition of different table grape cultivars produced in Slovenia. The journal of horticultural science & biotechnology. 2019, vol. 94, no. 3, str. 368-377. ISSN 1462-0316. DOI: 10.1080/14620316.2018.1504629. [COBISS.SI-ID 9088633]
4. MIKULIČ PETKOVŠEK, Maja, KORON, Darinka, RUSJAN, Denis. The impact of food processing on the phenolic content in products made from juneberry (Amelanchier lamarckii) fruits. Journal of food science. 2020, vol. 85, iss. 2, str. 386-393. ISSN 0022-1147. DOI: 10.1111/1750-3841.15030. [COBISS.SI-ID 9455481]
5. CRESPAN, Manna, MIGLIARO, Daniele, LARGER, Simone, PINDO, Massimo, PETRUSSI, Carlo, STOCCO, Marco, RUSJAN, Denis, SIVILOTTI, Paolo, VELASCO, Riccardo, MAUL, Erika. Unraveling the genetic origin of 'Glera', 'Ribolla Gialla' and other autochthonous grapevine varieties from Friuli Venezia Giulia (northeastern Italy). Scientific reports. 2020, vol. 10, iss. 1, art. no. 7206, str. 1-11. ISSN 2045-2322. https://doi.org/10.1038/s41598-020-64061-w, DOI: 10.1038/s41598-020-64061-w. [COBISS.SI-ID 13570563]
6. LIKAR, Matevž, STRES, Blaž, RUSJAN, Denis, VOGEL-MIKUŠ, Katarina, REGVAR, Marjana. Grapevine leaf ionome is shaped by soil factors and plant age. Plant, soil and environment. 2022, vol. 68, no. 9, str. 415–423. ISSN 1214-1178. https://doi.org/10.17221/22/2022-PSE, DOI: 10.17221/22/2022-PSE. [COBISS.SI-ID 124604931]

IZBRANE METODE ZA KARAKTERIZACIJO LESA IN LIGNOCELULOZNIH KOMPOZITOV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbrane metode za karakterizacijo lesa in lignoceluloznih kompozitov
Course title:	Selected methods for characterisation of wood and lignocellulosic composites
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037312
Koda učne enote na članici/UL Member course code:	3814

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
	10	15	0	0	100	5

Nosilec predmeta/Lecturer:	Miha Humar

Izvajalci predavanj:	
Izvajalci seminarjev:	Miha Humar
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	individualno raziskovalni/individual research

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	Basic preconditions for doctoral studies

Vsebina:	Content (Syllabus outline):
Les je v biološkem smislu definiran kot sekundarni ksilem, v tehničnem pa kot polimerni kompozit. Za les je tako značilna izjemna medvrstna variabilnost, prav tako pa tudi velika variabilnost znotraj vrste in celo posameznega drevesa. Četudi je les v splošnem zgrajen iz polimernih gradnikov, celuloze, lignina in hemiceluloz, je njihova vsebnost in razporeditev v	Wood is defined as a secondary xylem in biological sense, and as a polymer composite in a technical sense. Wood exhibits extremely high interspecific variability, which gets highly complex due to variability within the species and even within an individual tree. Although wood is in general composed of structural polymers cellulose, lignin and

steni posameznih celic dodaten dejavnik varibilnosti materiala. Les pa ni le variabilen in nehomogen temveč tudi izrazito anizotropen material. Poleg makromolekul, se v lesu nahajajo tudi nizko molekularne spojine (ekstraktivi), ki imajo kljub majhnemu deležu nesorazmerno velik vpliv na lastnosti lesa. Zaradi strukturne in kemijske variabilnosti ter nehomogenosti je les izredno zapleten raziskovalni objekt. Tako sistem vzorčenja kot priprava materiala in aplikacija sicer splošno uveljavljenih raziskovalnih metod terjajo specifične pristope. Namen predmeta je študentom doktorskega študija predstaviti najpomembnejše tehnike in metode, ki so na voljo na Oddelku za lesarstvo, oziroma metode, ki so nam na voljo na podlagi dogovorov s partnerskimi organizacijami. Študent bo pridobil pregled o njihovo primernost ter prednostih in slabostih v raziskavah lesa in lignoceluloznih materialov. Metode bodo predstavili predavatelji, ki jih redno uporabljajo pri svojem raziskovalnem delu in med drugim vključujejo različne tehnike mikroskopije (Digitalna, laserska konfokalna, vrstična elektronska), spektroskopske metode (FTIR, XRF, NMR, AAS, TOC, CNS, UV Vis, Hiperspektralno oslikovanje), metode za termične analize (DSC, TGA, DMA), kromatografske metode (TLC, HPLC), ekstrakcijske metode, utrujanje, metode mokre kemije, metode za analizo lesnih površin, mikrobiološke metode, destruktivna in nedestruktivna mehanska preizkušanja, reološke metode, metode kontrole vlažnosti lesa... V dogovoru z nosilcem predmeta in delovnim/predvidenim mentorjem bo študent izbral nekaj metod, jih teoretsko in praktično osvojil in uporabil na izbranem problemu, povezanim s temo predvidene doktorske naloge. Predmet ni namenjen le preiskavi lesa, temveč tudi analizi ostalih lignoceluloznih materialov, kot so rastlinska vlakna, papir, konoplja, miskantus…	hemicelluloses, their content and distribution in the wall of individual cells represent an additional factor in material variability. However, wood is not only variable and inhomogeneous material but anisotropic as well. In addition to macromolecules, wood contains relatively small amount of low molecular weight compounds, which in turn, have a high impact on wood properties. Wood is an extremely complicated research object due to its structural and chemical variability and heterogeneity. Hence, the system of sampling, preparation of material and application of commonly accepted methods demand a specific approach. The purpose of this course is to provide a short introduction regarding the selected techniques and methods to the PhD students. The methods will be selected from the pool of methods that are available at the Department of Wood Science and Technology, and methods that are available to us on the basis of agreements with partner organizations. The students will gain an overview of their suitability and their advantages and disadvantages when applied on wood and lignocellulosic materials. In the first step, the methods will be introduced by lecturers who are regularly using them in their research work. The most important methods are: various techniques of microscopy (digital, laser confocal microscopy, scanning electron microscopy), spectroscopic methods (FTIR, XRF, NMR, AAS, TOC, CNS, UV-Vis, hyperspectral imaging…), methods of thermal analysis (DSC, TGA, DMA …), fatigue, chromatographic methods (TLC , HPLC), extraction methods, methods of wet chemistry, methods for surface analysis, microbiological methods, destructive and non-destructive mechanical testing, rheological methods, methods to control moisture content of wood ... In agreement with a lecturer and the proposed supervisor and based on the planned research plan, a student will select few methods and theoretically and practically apply them to the selected problem. This course is not dedicated to wood only, but also to the analysis of other lignocellulosic materials, such as plant fibers, paper, hemp, miscanthus ...

Temeljna literatura in viri/Readings:

Niemz, Peter, Teischinger, Alfred, Sandberg, Dick; Springer handbook of wood science and technology. 2023. Cham: Springer Nature. doi:10.1007/978-3-030-81315-4.
Hon, D.N.S. in Shiraishi, N., 2000. Wood and Cellulosic Chemistry, Revised, and Expanded. 2. izd. [eBook] Taylor & Francis Group. https://doi.org/10.1201/9781482269741.
Na razpolago tudi gradivo s predavanj in vaj v elektronski obliki. Gradivo bo objavljeno pred začetkom predavanj na spletni strani. Za izdelavo seminarskih nalog in dodatno razumevanje vsebin bodo študentje uporabili tudi svetovni splet (internet).

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je seznaniti slušatelje z izbranimi metodami za analizo lesa,lesnih kompozitov in	The aim of this course is to inform students with selected methods for the analysis of wood, wood

različnih drugih lignoceluloznih materialov. Študentom bomo predstavili tako teoretske osnove, kot tudi možne aplikacije izbranih metod. V okviru predmeta se bodo seznanili tako s prednostmi, kot tudi omejitvami posameznih metod. Kompetence: Posamezne metode bodo preizkušene na realnem primeru. Te metode bodo študentje sposobni samostojno uporabiti pri nadaljnjem raziskovalnem delu.	based composites, and various other lignocellulosic materials. Students will be informed both on theoretical foundations as well as on possible applications of the selected methods on wood or wood based materials. The topic of the course will be about both the advantages and limitations of the selected methods. Competencies: Each method will be applied on a real case. These methods will enable students to perform independent research in the frame of their future research work.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Spoznati najpomembnejše raziskovalne metode, ki so na voljo za analizo lesa in lignoceluloznih kompozitov. *Refleksija:* Kritično ovrednotiti primernost posamezne raziskovalne metode za dosego raziskovalnega cilja. *Uporaba:* Uporabiti izbrane metode na lastnem problemu in jih preizkusiti na praktičnem primeru v laboratoriju. Naučiti se izbrati ustrezne metode za potrditev postavljene hipoteze.	Knowledge and Understanding: To learn about the most important research methods that are available for the analysis of wood and lignocellulosic composites. Reflection: To evaluate Critically the suitability of particular research methods in order to achieve the research objective. Application: To use the chosen methods on the problem of their own and apply them on a case study in the laboratory. To learn how to choose the appropriate method to confirm selected hypotheses.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Seminarji (10 ur), Laboratorijske vaje (15 ur)	Seminar (10 h) Laboratory work (15 h)

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in ustni izpit	60,00 %	Oral and written exam
Seminar	40,00 %	Seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Miha Humar

1. KLEMENC, Jernej, HUMAR, Miha, FAJDIGA, Gorazd. Influence of insect damage to the fatigue life of an old larch wood. Construction & building materials. [Online ed.]. 2023, vol. 375, 1 spletni vir (1 datoteka pdf ([13] str.)). ISSN 1879-0526. https://www.sciencedirect.com/science/article/pii/S0950061823006888, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=144806, DOI: 10.1016/j.conbuildmat.2023.130976.
2. HUMAR, Miha, LESAR, Boštjan, KRŽIŠNIK, Davor. Moisture performance of various wooden shingles designs tested on the Golobar cable yarding. Wood material science & engineering. 2023, vol. <sprejeto v objavo>, no. <sprejeto v objavo>, str. 1-11. ISSN 1748-0280. https://www.tandfonline.com/doi/full/10.1080/17480272.2023.2199714?src=, DOI: 10.1080/17480272.2023.2199714.

3. KERŽIČ, Eli, HUMAR, Miha. Studies on the material resistance and moisture dynamics of wood after artificial and natural weathering. Wood material science & engineering. 2022, vol. 17, no. 6, str. 551-557, ilustr. ISSN 1748-0280. https://www.tandfonline.com/doi/full/10.1080/17480272.2021.1902388, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=143672, DOI: 10.1080/17480272.2021.1902388.
4. HUMAR, Miha, BALZANO, Angela, GRBEC, Samo, GRIČAR, Jožica, KRŽIŠNIK, Davor, LESAR, Boštjan, VEK, Viljem. Investigation of the material resistance and moisture performance of pubescent oak (Quercus pubescens). Holzforschung. [Online ed.]. 2021, vol. 75, iss. 1, str. 22-36, ilustr. ISSN 1437-434X. https://www.degruyter.com/document/doi/10.1515/hf-2020-0045/html, DOI: 10.1515/hf-2020-0045.
5. HUMAR, Miha, KRŽIŠNIK, Davor, LESAR, Boštjan, BRISCHKE, Christian. The performance of wood decking after five years of exposure : verification of the combined effect of wetting ability and durability. Forests. [Online ed.]. 2019, vol. 10, iss. 10, 17 str., ilustr. ISSN 1999-4907. https://www.mdpi.com/1999-4907/10/10/903, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=132231, DOI: 10.3390/f10100903.
6. ŽLAHTIČ ZUPANC, Mojca, MIKAC, Urška, SERŠA, Igor, MERELA, Maks, HUMAR, Miha. Water distribution in wood after short term wetting. *Cellulose*. Jan. 2019, vol. 26, iss. 2, str. 703-721. ISSN 0969-0239. DOI: 10.1007/s10570-018-2102-y.

IZDELAVA DOKTORSKE DISERTACIJE IN JAVNI ZAGOVOR

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izdelava doktorske disertacije in javni zagovor
Course title:	Preparation of a doctoral dissertation and public defence
Članica nosilka/UL Member:	

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski (v postopku)	Ni členitve (študijski program)	4. letnik	Celoletni	obvezni

Univerzitetna koda predmeta/University course code:	0141755
Koda učne enote na članici/UL Member course code:	2740

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	125	0	5

Nosilec predmeta/Lecturer:	

Izvajalci predavanj:	
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	obvezni

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

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:

Ocenjevalna lestvica:	Grading system:

Reference nosilca/Lecturer's references: