UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Dendroekologija, rastne in strukturne značilnosti gozdnih sestojev**
Course title:	**Dendroecology, growth and structure characteristics of forest stands**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**10**	**15**	**/**	**5**	**85**	**5**

Nosilec predmeta / Lecturer:	Nosilec: doc. dr. Tomislav Levanič

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Dokončan drugostopenjski študij biologije, biotehnologije, gozdarstva, krajinske arhitekture ali primerljivih programov, lahko tudi končan univerzitetni študij po starih programih za omenjene smeri. Upoštevajo se tudi splošni pogoji za vpis na doktorski študij	Completed second degree of studies of biology, biotechnology, forestry and landscape architecture or from comparable programs; eligible are also old programmes of above mentioned studies. The general requirements for admission to doctoral studies are required

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

Dendroekologija: osnove dendrokronološkega dela, načrtovanje vzorčenja, odvzem vzorcev, priprava za merjenje, kontrola podatkov, datiranje in sinhroniziranje. Opis branike kot osnovne enota dendrokronologije. Anomalije branik. Tehnike standardizacije dendrokronoloških podatkov ter povezava med okoljskimi dejavniki (klima, ostali dejavniki) in različnimi podatki, vezanimi na braniko (širina, razmerje med ranim in kasnim lesom, širino ranega in kasnega lesa, gostoto, izotopsko zgradbo,...). Rastni procesi v sestoju: modeliranje rasti in razvoja sestojev. Napovedljivost in usmerljivost razvoja sestojev. Analiza in modeliranje kakovostne zgradbe sestoja ter vrednostnih karakteristik gozdnih ekosistemov. Kalkulacija in napoved donosov v sestoju. Odzivi gozdov na ukrepanje.	Dendroecology: fundamentals of dendroecological research, sampling design, sample collection, measurements, quality control of measured data, crossdating and synchronising. Tree-ring as a basic unit of dendrochronological studies, tree-ring anomalies. Standardisation of dendrochronological time series and statistical connection with environmental data (climate, other factors). Study of different tree-ring parameters, such as width, early- to latewood ratio, stable isotope composition,…) Growth processes in forest stands: modelling of growth and development of forest stands. Ability to predict and to guide forest stand development; analysis and modelling of stand quality structure, value characteristics of forest ecosystems. Calculations and forecasting of forest stand yields; response of forest on management activities

Temeljni literatura in viri / Readings:

Cook, E. R. / Kairiukstis, L. A., 1989. Methods of dendrochronology (applications in the environmental sciences).- Dordrecht, Boston, London, Kluwer academic publishers, 394 s.
Hans-Peter Kahle, Timo Karjalainen, Annette Schuck, Göran I. Ågren, Seppo Kellomäki, Karl Mellert, Jörg Prietzel, Karl-Eugen Rehfuess and Heinrich Spiecker (editors). 2008. Causes and Consequences of Forest Growth Trends in Europe - Results of the Recognition Project. EFI, Research Report 21, Brill Academic Publishers: Leiden, Boston, Köln, 262 s.
Kimmins, J. P., 1997. Forest Ecology: A Foundation for Sustainable Management. Prentice Hall, Upper Saddle River, New Jersey, 596 str.
Legendre, P., Legendre L. 1998. Numerical Ecology. Developments in Enironmental Modelling, 20, Elsevier Science, 870 s.
Levanič, T. Dendrokronologija – skripta.
Pretzsch, H. 2001. Modellirung des Waldwachtums. Parey Berlin, 341 s.
In revijalni članki s področja, tekoča periodika, druga učna gradiva…

Cilji in kompetence:	**Objectives and competences:**
Cilj je spoznati aktualne raziskovalne vsebine in tehnike s področij dendroekologije in prirastoslovja.	The aim is to learn about current research topics and techniques in the fields of dendroecology and growth and yield studies.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Kandidat pridobi znanja o strukturi, rasti, razvoju gozdnih sestojev, njihovi odzivnosti na izvedene ukrepe in druge vplive. Spozna osnove dendroekologije; osvoji tehnike	Knowledge and understanding: The student acquires knowledge about the structure, growth and development of forest stands, their responsiveness to the measures taken and other environmental factors. Learn

vzorčenja, merjenje, datiranja in sinhroniziranja drevesnih branik. Seznanitev z modeliranjem razvoja gozdnih sestojev ter z dendrokronološkimi metodami modeliranja odziva dreves na okoljske dejavnike.	the basics of dendroecology; get familiar with the techniques of sampling, measurement, crossdating and synchronization of tree-ring sequences. Become familiar with the modelling techniques for the development of forest stands and with dendrochronological methods of modelling the response of trees to environmental factors.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (izbrane vsebine), konzultacije, laboratorijske in seminarske vaje, terensko delo, vključitev v raziskovalni projekt.	Lectures (selected topics), consultations, laboratory and tutorials, fieldwork, inclusion in the research project.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminarske naloge in izpit. Ocena izpita je povprečje ocene izpita, ocene seminarskih del in ocene raziskovalne uspešnosti kandidata.	**100%**	Seminar papers and exam. Exam score is the average of the assessment exam, evaluation seminar of the research and evaluation of student performance.

Reference nosilca / izvajalcev / Lecturer's references:

Tomislav Levanič

LEVANIČ, Tom, ČATER, Matjaž, MCDOWELL, Nate G. Associations between growth, wood anatomy, carbon isotope discrimination and mortality in a Quercus robur forest. *Tree physiology*, ISSN 0829-318X, 2011, vol. 31, št. 3, str. 298-308, ilustr. http://dx.doi.org/10.1093/treephys/tpq111, doi: 10.1093/treephys/tpq111. [COBISS.SI-ID 3118246], [JCR, SNIP, WoS do 11. 2. 2014: št. citatov (TC): 10, čistih citatov (CI): 9, čistih citatov na avtorja (CIAu): 3.00, normirano št. čistih citatov (NC): 8, Scopus do 29. 1. 2014: št. citatov (TC): 9, čistih citatov (CI): 9, čistih citatov na avtorja (CIAu): 3.00, normirano št. čistih citatov (NC): 8]
kategorija: 1A1 (Z1, A'', A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB točke: 49.67, št. avtorjev: 3

LEVANIČ, Tom, POPA, Ionel, POLJANŠEK, Simon, NECHITA, Constantin. A 323-year long reconstruction of drought for SW Romania based on black pine (Pinus Nigra) tree-ring widths. *International journal of biometeorology*, ISSN 0020-7128, 2013, vol. 57, no. 5, str. 703-714, ilustr. http://dx.doi.org/10.1007/s00484-012-0596-9, doi: 10.1007/s00484-012-0596-9. [COBISS.SI-ID 3462054], [JCR, SNIP, WoS do 16. 9. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 26. 8. 2013: št. citatov (TC): 0,

čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A2 (Z1, A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 24.49, št. avtorjev: 4

LEVANIČ, Tom, GRIČAR, Jožica, GAGEN, Mary, JALKANEN, Risto, LOADER, Neil J., MCCARROLL, Danny, OVEN, Primož, ROBERTSON, Iain. The climate sensitivity of Norway spruce (Picea abies (L.) karst) in the southeastern European Alps. *Trees*, ISSN 0931-1890, 2009, vol. 23, no. 1, str. 169-180, ilustr. http://dx.doi.org/10.1007/s00468-008-0265-0, doi: 10.1007/s00468-008-0265-0. [COBISS.SI-ID 2249894], [JCR, SNIP, WoS do 21. 10. 2013: št. citatov (TC): 16, čistih citatov (CI): 14, čistih citatov na avtorja (CIAu): 1.75, normirano št. čistih citatov (NC): 13, Scopus do 27. 8. 2013: št. citatov (TC): 17, čistih citatov (CI): 16, čistih citatov na avtorja (CIAu): 2.00, normirano št. čistih citatov (NC): 15]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 13.31, št. avtorjev: 8

HAFNER, Polona, MCCARROLL, Danny, ROBERTSON, Iain, LOADER, Neil J., GAGEN, Mary, YOUNG, Giles, BALE, Roderick J., SONNINEN, E., **LEVANIČ, Tom.** A 520 year record of summer sunshine for the eastern European Alps based on stable carbon isotopes in larch tree rings. *Climate dynamics*, ISSN 0930-7575, 2013, vol. <v tisku>, no. <v tisku>, str. <v tisku>, ilustr. http://dx.doi.org/10.1007/s00382-013-1864-z, doi: 10.1007/s00382-013-1864-z. [COBISS.SI-ID 3677862], [JCR, SNIP, Scopus do 29. 7. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologija ni verificirana
točke: 14.84, št. avtorjev: 9

POLJANŠEK, Simon, CEGLAR, Andrej, **LEVANIČ, Tom**. Long-term summer sunshine/moisture stress reconstruction from tree-ring widths from Bosnia and Herzegovina. *Climate of the past*, ISSN 1814-9324, 2013, vol. 9, no. 1, str. 27-40, ilustr. http://dx.doi.org/10.5194/cp-9-27-2013, doi: 10.5194/cp-9-27-2013. [COBISS.SI-ID 3536294], [JCR, SNIP, WoS do 8. 5. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 27. 2. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus; tipologijo je verificiral OSICB
točke: 42.84, št. avtorjev: 3

ČATER, Matjaž, **LEVANIČ, Tom**. Response of Fagus sylvatica L. and Abies alba Mill. in different silvicultural systems of the high Dinaric karst. *Forest Ecology and Management*, ISSN 0378-1127. [Print ed.], 2013, vol. 289, str. 278-288, ilustr. http://dx.doi.org/10.1016/j.foreco.2012.10.021, doi: 10.1016/j.foreco.2012.10.021. [COBISS.SI-ID 3494310], [JCR, SNIP, WoS do 15. 4. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 10. 12. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 72.19, št. avtorjev: 2

BABST, Flurin, **LEVANIČ, Tom**, et al. Site- and species-specific responses of forest growth to climate across the European continent. *Global ecology and biogeography*, ISSN 1466-822X, 2013, vol. <v tisku>, no. <v tisku>, str. <v tisku>, ilustr. http://dx.doi.org/10.1111/geb.12023, doi: 10.1111/geb.12023. [COBISS.SI-ID 3533478], [JCR, SNIP, WoS do 12. 2. 2014: št. citatov (TC): 4, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 0.34, normirano št. čistih citatov (NC): 2, Scopus do 19. 2. 2014: št. citatov (TC): 8, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 0.68, normirano št. čistih citatov (NC): 4]
kategorija: 1A1 (Z1, A'', A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologija ni verificirana
točke: 14.46, št. avtorjev: 15

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Dendrologija in gozdni genski viri**
Course title:	**Dendrology and forest genetic resources**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**30**	**/**	**/**	**/**	**85**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Robert Brus

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Zahtevani so splošni pogoji za vpis na doktorski študij.	General prerequisites for the enrollment in the doctoral study are required.

Vsebina:	Content (Syllabus outline):
Paleobotanika, paleoekologija, filogenija in biogeografija pomembnejših drevesnih družin, rodov in vrst, genetski vidiki evolucije, evolucijski procesi v naravnih populacijah gozdnih drevesnih vrst in speciacija, zgodovinski razvoj gozdov v svetu in Sloveniji. Ledenodobna zatočišča in poledenodobni razvoj glavnih drevesnih vrst. Raziskave populacij gozdnega drevja: naravna variabilnost in prilagoditveni potencial izbranih drevesnih vrst, njun pomen in dejavniki, ki ju ogrožajo, novosti iz sistematike. Pomen gozdnih genskih virov in njihovega ohranjanja. Vpliv gospodarjenja z gozdom na genetsko strukturo populacij gozdnega drevja, pomen ohranjanja genetske variabilnosti kot pomembnega prilagoditvenega potenciala naravnih populacij gozdnega drevja. Oblikovanje sodobnih žlahtniteljskih programov za izbrane gozdne drevesne vrste. Biotehnologija v gozdarstvu, njeni možni vplivi na okolje in njihovo vrednotenje. Zunajgozdni nasadi drevesnih vrst, problematika vnašanja tujih drevesnih vrst. Invazivne drevesne vrste, njihov vpliv na stabilnost ekosistemov in možnosti njihovega obvladovanja.	Paleobotany, paleoecology, philogeny and biogeography of important tree families, genera and species, genetic aspects of the evolution, evolutionary processes in natural populations of forest tree species and speciation, historical development of forests in the world and in Slovenia. Gglacial refugia and postglacial spread of main tree species. Research of the populations of forest tree species: natural variation and adaptive potential of selected tree species, their importance and threatening factors, new findings in taxonomy. The importance of forest genetic resources and their conservation. The impact of forest management on the genetic structure of populations of forest tree species, the importance of the conservation of genetic variation as imortant factor of the adaptive potential of the natural populations of forest trees. The design of contemporary forest tree breeding programmes. Biotechnology in forestry, its potential environmental impacts and their evaluation. Plantations of forest tree species outside forest, problems of the introduction of non-nativ tree species. Invasive tree species, their impact on the ecosystem stability and the measures for their management.

Temeljni literatura in viri / Readings:

- Briggs, D.E.G., 2003. Palaeobiology II. Oxford, Blackwell, 583 s.
- Eriksson, G., Ekberg, I., Clapham, D., 2006. An Introduction to Forest Genetics. Uppsala, 185 s.
- Geburek, T., Turok, J. (eds.), 2005. Conservation and Management of Forest Genetic Resources in Europe. Arbora Publishers, 700 s.
- Roloff, A., et al, 1996-2014. Enzyklopädie der Holzgewächse: Handbuch und Atlas der Dendrologie. Wiley.

- tekoča znanstvena periodika

Cilji in kompetence:	Objectives and competences:

Izobraževalni cilji so nadgraditi temeljna znanja na področju dendrologije, gozdne genetike in ohranjanja gozdnih genskih virov, prav tako pa poglobiti razumevanje temeljnih mehanizmov in procesov pri gospodarjenju z gozdnimi ekosistemi. Kompetence, ki jih pridobi kandidat, obsegajo poglobljeno znanje s področja in obvladovanje raziskovalnih metod. Pridobljeno poglobljeno temeljno znanje je sposoben povezovati in nadgrajevati z drugimi raziskovalnimi področji.	Educational objectives include the upgrade of basic knowledge from the dendrology, forest genetics and conservation of forest genetic resources as well as the improvement of understanding ob basic mechanisms and processes in the forest management. Candidates' competences include deepened knowledge from the area and the mastering of research methods. He is capable to upgrade the acquired basic knowledge and to link it with other research areas.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: slušatelj se usposobi za samostojno raziskovalno delo na obravnavanem področju. Osvoji obvladovanje sodobnih raziskovalnih metod in izvajanja aplikativnih in temeljnih raziskav. Pridobi tudi spretnosti akademskega nastopanja in argumentiranja svojih stališč, prav tako je sposoben razumevanja načinov in pomena povezovanja raziskovalnega, razvojnega in pedagoškega dela.	Knowledge and understanding: the candidate acquires the qualification for independent research work in the research area. He masters the contemporary research methods and the conduction of aplicative and basic research. He acquires the skills of academic presentations and the argumentation of his position. He also understands the techniques and the importance of linking of research, developmental and pedagogical work.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Izbrana poglavja določenih vsebin (predavanja ali konzultacije), voden seminar, izdelava seminarskega dela in njegov zagovor, sodelovanje pri raziskovalnem delu nosilca.	Selected chapters of certain contents (lectures or consultations), guided seminary, elaboration of seminary work and its defence, participation in the research work of a lecturer.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ocena izpita je sestavljena iz: - seminarja in njegovega zagovora in - ustnega izpita.	 50 % 50 %	Exam grade consists of: - seminar and its defence - oral exam.

Reference nosilca / izvajalcev / Lecturer's references:

Prof. dr. Robert Brus

BRUS, Robert, 2010. Growing evidence for the existence of glacial refugia of European beech (*Fagus sylvatica* L.) in the south-eastern Alps and north-western Dinaric Alps. *Period. biol.*, 2010, vol. 112, no. 3, str. 239-246, ilustr. [COBISS.SI-ID 3010470], IF (2010) = 0,117. (CAB AN 20123347924)

HEMERY, G. E., CLARK, J. R., ALDINGER, E., CLAESSENS, H., MALVOLTI, M. E., O'CONNOR, E., RAFTOYANNIS, Y., SAVILL, P. S., **BRUS, Robert**, 2010. Growing scattered broadleaved tree species in Europe in a changing climate : a review of risks and opportunities. *Forestry (Lond.)*, 2010, vol. 83, no. 1, 65-81. http://dx.doi.org/10.1093/forestry/cpp034, doi: 10.1093/forestry/cpp034. [COBISS.SI-ID 2508198], IF (2010) = 1,46. (CAB AN 20103070297)

BRUS, Robert, BALLIAN, Dalibor, BOGUNIĆ, Faruk, BOBINAC, Martin, IDŽOJTIĆ, Marilena, 2011. Leaflet morphometric variation of service tree (*Sorbus domestica* L.) in the Balkan Peninsula. *Plant Biosyst. (Firenze, Testo stamp.)*, 2011, vol. 145, no. 2, str. 278-285, ilustr. http://dx.doi.org/10.1080/11263504.2010.549660, doi: 10.1080/11263504.2010.549660. [COBISS.SI-ID 3156390], IF (2011) = 1,418. (CAB AN 20113262076)

BRUS, Robert, BALLIAN, Dalibor, ZHELEV, Petr, PANDŽA, Marija, BOBINAC, Martin, ACEVSKI, Jane, RAFTOYANNIS, Yannis, JARNI, Kristjan, 2011. Absence of geographical structure of morphological variation in *Juniperus oxycedrus* L. subsp. *oxycedrus* in the Balkan Peninsula. *European journal of forest research (Print)*, 2011, vol. 130, no. 4, str. 657-670, ilustr. http://dx.doi.org/10.1007/s10342-010-0457-1, doi: 10.1007/s10342-010-0457-1. [COBISS.SI-ID 3086502], IF (2011) = 1,982. (CAB AN 20113221436)

JARNI, Kristjan, DE CUYPER, Bart, **BRUS, Robert**, 2012. Genetic variability of Wild Cherry (*Prunus avium* L.) seed stands in Slovenia as revealed by nuclear microsatellite loci. *PloS one*, 2012, vol. 7, iss. 7, 5 str. http://dx.doi.org/10.1371/journal.pone.0041231, doi: 10.1371/journal.pone.0041231. [COBISS.SI-ID 3415974], IF (2012) = 3,73. (CAB AN 20123288777)

GAJŠEK, Domen, JARNI, Kristjan, **BRUS, Robert**, 2013. Infection patterns and hosts of *Arceuthobium oxycedri* (DC.) M. Bieb. in Slovenia. *For. pathol. (Print)*, 2013, vol. 43, no. 3, str. 185-192, ilustr. http://dx.doi.org/10.1111/efp.12014, doi: 10.1111/efp.12014. [COBISS.SI-ID 3490726], IF (2012) = 1,67. (CAB AN 20133225998)

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Fiziologija gozdnega drevja in interakcije v gozdnih tleh**
Course title:	**Physiology of forest trees and interactions in forest soils**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**25**	**5**	**/**	**5**	**80**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Hojka Kraigher

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

Temeljni 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.	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.

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.	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. 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.	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 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 (v %) / Weight (in %)	**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.	**100**	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.

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.		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.

Reference nosilca / izvajalcev / Lecturer's references:

Hojka Kraigher

1. DECKMYN, Gabrielle I., MAYER, A., SMITS, M. M., EKBLAD, A., GREBENC, Tine, KOMAROV, Alexander S., KRAIGHER, Hojka. Simulating ectomycorrhizal fungi and their role in carbon and nitrogen cycling in forest ecosystems. *Canadian journal of forest research*, ISSN 0045-5067, 2014, vol. 44, iss. 6, str. 535-553, ilustr. http://dx.doi.org/10.1139/cjfr-2013-0496, http://eprints.gozdis.si/484/, doi: 10.1139/cjfr-2013-0496. [COBISS.SI-ID 3818150]
2. SCHUELER, Silvio, FALK, Wolfgang, KOSKELA, Jarkko, LEFÈVRE, François, BOZZANO, Michele, HUBERT, Jason, KRAIGHER, Hojka, LONGAUER, Roman, OLRIK, Ditte C. Vulnerability of dynamic genetic conservation units of forest trees in Europe to climate change. *Global change biology*, ISSN 1354-1013, 2014, vol. 20, no. 5, str. 1498-1511, ilustr. http://dx.doi.org/10.1111/gcb.12476, doi: 10.1111/gcb.12476. [COBISS.SI-ID 3780006]
3. EKBLAD, A., KRAIGHER, Hojka, et al. The production and turnover of extramatrical mycelium of ectomycorrhizal fungi in forest soils: role in carbon cycling. *Plant and soil*, ISSN 0032-079X. [Print ed.], 2013, vol. 366, no. 1/2, str. 1-27, ilustr. http://dx.doi.org/10.1007/s11104-013-1630-3, http://eprints.gozdis.si/483/, doi: 10.1007/s11104-013-1630-3. [COBISS.SI-ID 3568294]
4. WALLANDER, H., KRAIGHER, Hojka, et al. Evaluation of methods to estimate production, biomass and turnover of ectomycorrhizal mycelium in forests soils - a review. *Soil biology & biochemistry*, ISSN 0038-0717. [Print ed.], 2013, vol. 57, str. 1034-1047. http://dx.doi.org/10.1016/j.soilbio.2012.08.027, doi: 10.1016/j.soilbio.2012.08.027. [COBISS.SI-ID 3432102]
5. KOSKELA, Jarkko, KRAIGHER, Hojka, et al. Translating conservation genetics into management : Pan-European minimum requirements for dynamic conservation units of forest tree genetic diversity. *Biological Conservation*, ISSN 0006-3207. [Print ed.], 2013, vol. 157, str. 39-49, ilustr. http://dx.doi.org/10.1016/j.biocon.2012.07.023, doi: 10.1016/j.biocon.2012.07.023. [COBISS.SI-ID 3490982]
6. LEFÉVRE, François, KRAIGHER, Hojka, WESTERGREN, Marjana, et al. Dynamic conservation of forest genetic resources in 33 European countries. *Conservation biology*, ISSN 0888-8892, 2013, vol. 27, no. 2, str. 373-384, ilustr. http://dx.doi.org/10.1111/j.1523-1739.2012.01961.x, doi: 10.1111/j.1523-1739.2012.01961.x. [COBISS.SI-ID 3506854]
7. SCHUELER, Silvio, KRAIGHER, Hojka, et al. Adaptive genetic diversity of trees for forest conservation in a future climate : a case study on Norway spruce in Austria. *Biodiversity and conservation*, ISSN 0960-3115, 2012, vol. 22, iss. 5, str. 1151-1166, ilustr. http://dx.doi.org/10.1007/s10531-012-0313-3, doi: 10.1007/s10531-012-0313-3. [COBISS.SI-ID 3424678]
8. PIŠKUR, Barbara, BAJC, Marko, ROBEK, Robert, HUMAR, Miha, SINJUR, Iztok, KADUNC, Aleš, OVEN, Primož, REP, Gregor, AL SAYEGH-PETKOVŠEK, Samar, KRAIGHER, Hojka, JURC, Dušan, POHLEVEN, Franc. Influence of Pleurotus ostreatus inoculation on wood degradation and fungal colonization. *Bioresource technology*, ISSN 0960-8524. [Print ed.], vol. 102, iss. 22, str. 10611-10617, ilustr. http://dx.doi.org/10.1016/j.biortech.2011.09.008, doi: 10.1016/j.biortech.2011.09.008. [COBISS.SI-ID 3235494]
9. DECKMYN, Gabrielle I., CAMPIOLI, M., MUYS, B., KRAIGHER, Hojka. Simulating C cycles in forest soils : including the active role of microorganisms in the ANAFORE forest model. *Ecological modelling*, ISSN 0304-3800. [Print ed.], 2011, vol. 222, št. 12, str. 1972-1985, ilustr.

http://dx.doi.org/10.1016/j.ecolmodel.2011.03.011, doi: 10.1016/j.ecolmodel.2011.03.011. [COBISS.SI-ID 3149990]
10. DECKMYN, Gabrielle I., MALI, Boštjan, KRAIGHER, Hojka, TORELLI, Niko, OP DE BEECK, Maarten, CEULEMANS, R. J. M. Using the process-based stand model ANAFORE including bayesian optimisation to predict wood quality and quantity and their uncertainty in Slovenian Beech. *Silva Fennica*, ISSN 0037-5330, 2009, vol. 43, no. 3, str. 523-533, ilustr. [COBISS.SI-ID 2423974]
1.16 Samostojni znanstveni sestavek ali poglavje v monografski publikaciji(izbor / selection)

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Gozdna tehnika in gozdno delo**
Course title:	**Forest Techniques and Forest Work**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of Forest Ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**20**	**/**	**/**	**5**	**90**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Igor Potočnik

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

Temeljni literatura in viri / Readings:

Samset, I.1985. Winch and Cable Systems. Martinus Nijhoff/Dr.Junk Publ., Dordrecht Netherland, p.539

Sundberg U./Silversides C.R. 1988. Operational Efficency in Forestry, Vol. 1 Analysis.- Kluwer Academic Publ., Dordrecht, Boston, London, 219 s.

Sundberg U./Silversides C.R. 1988. Operational Efficency in Forestry, Vol. 2 Practice.- Kluwer Academic Publ., Dordrecht, Boston, London, 169 s.

REFA-Fachausschuss Forstwirtschaft. 2004. Organisation in der Forstwirtschaft. Weinheim, Diesbach, 283 str.

-, 2000. Environmental Noise. Brüel & Kjær Sound & Vibration Measurement A/S, 64 str.

- Revijalni članki s področja, tekoča periodika

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 (v %) / Weight (in %)	Assessment:
Seminar	**100 %**	Seminar work

Reference nosilca / izvajalcev / Lecturer's references:

Prof. dr. Igor Potočnik

PENTEK, Tibor, PIČMAN, Dragutin, NEVEČEREL, Hrvoje, LEPOGLAVEC, Kruno, PAPA, Ivica, POTOČNIK, Igor. Primarno otvaranje šuma različitih reljefnih područja Republike Hrvatske = Primary forest opening of different relief areas in the Republic of Croatia. *Croatian journal of forest engineering*, ISSN 1845-5719, 2011, vol. 32, iss. 1, str. 401-416, ilustr. [COBISS.SI-ID 3167398], [JCR, SNIP, WoS]

POTOČNIK, Igor, POJE, Anton. Noise pollution in forest environment due to forest operations = Zagađanje šumskog okoliša bukom pri izvođenju šumskih radova. *Croatian journal of forest engineering*, ISSN 1845-5719, 2010, vol. 31, no. 2, str. 137-148, ilustr. [COBISS.SI-ID 3103142], [JCR, SNIP, WoS]

PENTEK, Tibor, NEVEČEREL, Hrvoje, DASOVIĆ, Katarina, PORŠINSKY, Tomislav, ŠUŠNJAR, Marijan, POTOČNIK, Igor. Analiza sekundarne otvorenosti šuma gorskog područja kao podlaga za odabir duljina uža vitla = Analysis of secondary relative openness in hilly areas as a basis for selection of winch rope length. *Šumarski list*, ISSN 0373-1332, 2010, letn. 134, št. 5/6, str. 241-248, ilustr. [COBISS.SI-ID 2975398], [JCR, SNIP, WoS]

POTOČNIK, Igor, PENTEK, Tibor, POJE, Anton. Severity analysis of accidents in forets operations = Analiza težine nesreća pri šumskim radovima. *Croatian journal of forest engineering*, ISSN 1845-5719, 2009, vol. 30, no. 2, str. 171-184, ilustr. http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=73858. [COBISS.SI-ID 2524326], [JCR, SNIP, WoS]

POTOČNIK, Igor, PENTEK, Tibor, PIČMAN, Dragutin, PAPA, Ivica, POJE, Anton. Filling in the clearance of a forest road cross-section in beech forest. *Croatian journal of forest engineering*, ISSN 1845-5719, 2008, vol. 29, no. 1, str. 53-62, ilustr. http://hrcak.srce.hr/25729. [COBISS.SI-ID516531481], [JCR, SNIP, WoS]

PENTEK, Tibor, NEVEČEREL, Hrvoje, PORŠINSKY, Tomislav, PIČMAN, Dragutin, LEPOGLAVEC, Kruno, POTOČNIK, Igor. Methodology for development of secondary forest traffic infrastrucure cadastre. *Croatian journal of forest engineering*, ISSN 1845-5719, 2008, vol. 29, iss. 1, str. 75-83, ilustr. [COBISS.SI-ID 2265510], [JCR, SNIP, WoS]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Metode ekološkega modeliranja**
Course title:	**Methods of ecological modelling**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**10**	**25**	**/**	**/**	**80**	**5**

Nosilec predmeta / Lecturer:	Nosilec: Marko Debeljak

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment to a PhD study programme.

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

Vsebina predmeta ja izrazito metodološka, kjer je glavni poudarek na: - sistemskem pristopu k razumevanju ekosistemov in uporabo sistemskega razmišljanja pri definiranju problemov, - temeljnih principih ekološkega modeliranja, - izgradnji mehanističnih modelov, modelov iz velikih zbirk podatkov in modelov za podporo odločanja. V prvem delu predmeta se slušatelji seznanijo s temeljnimi principi sistema in sistemskega razmišljanja, ki jim omogoča celosten vpogled v strukturo in delovanje obravnavanega sistema (ekosistema). Velik poudarek je na pravilni opredelitvi in definiciji problema in v njegovem pravilnem formuliranju v obliki cilja, ki ga poskušajo v nadaljevanju doseči z metodami ekološkega modeliranja. V drugem vsebinskem sklopu je poudarek na konceptih ekološkega modeliranja, ki so podani v obliki potrebnih korakov in pravil za dosego metodološke objektivnosti izgradnje ekološkega modela. V zadnjem sklopu predmeta so obravnavane tri temeljne skupine ekoloških modelov: mehanistični modeli, modeli iz podatkov in kvalitativni modeli. Vsebino predmeta je tako zajeta v naslednjih šest sklopih: 1. Uvod v ekološko modeliranje, 2. Sistem, 3. Koncepti ekološkega modeliranja, 4. Mehanistični modeli, 5. Modeli iz podatkov in 6. Modeli za podporo odločanja.	The course is highly methodological oriented where the main focus is on: - a system approach to understanding ecosystems and application of systems thinking for definition of the problems, - fundamental principles of ecological modelling, - construction of mechanistic models, models from large datasets and qualitative models for decision support. In the first part of the course, students are introduced to the fundamental principles of systems and systems thinking, which allows them to gain a comprehensive insight into the structure and functioning of the studied system (e.g., ecosystem). The main focus is on the correct definition and proper formulation of the problems and their solutions by application of the ecological modelling methods. The second part of the course is focused on the concepts of ecological modelling, which are given in the form of steps and rules required to achieve the methodological correctness of building an ecological model. The last part of the course addresses three basic groups of ecological models: mechanistic models, models constructed from datasets, and qualitative models. The content of the course consists from the following six sections: 1. Introduction to ecological modelling, 2. A system, 3. Concepts of ecological modelling, 4. Mechanistic models, 5. Models from large datasets and 6. Qualitative decision support models.

Temeljni literatura in viri / Readings:

Jørgensen, S.E., Bendoricchio, G., 2011. Fundamentals of ecological modelling : applications in environmental management and research . 4th ed., Elsevier

Witten H.I., Frank E., Hall M.A., 2011. Data mining : practical machine learning tools and techniques. 3rd. ed., Morgan Kaufmann

Bohanec M. 2012. Odločanje in modeli. 1. ponatis. Ljubljana, DMFA

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

Osnovni cilj tega sklopa predavanj je študentom podati znanje o sodobnih metodah ekološkega modeliranja za potrebe razumevanja strukture in delovanja ekosistemov in za objektivno napovedovanje njihovega obnašanja. Študenti bodo pridobili metodološka znanja potrebna za izgradnjo kvalitativnih in kvantitativnih ekoloških modelov, ki jim bodo omogočala pridobivanje novih znanj o obnašanju preučevanega ekosistema (modeli za razlago), sposobni bodo napovedati njegovo obnašanje (napovedni modeli) in graditi modele za upravljanje teh sistemov (modeli za podporo odločanja).	The main of objective of the course is to provide students with knowledge about modern methods of ecological modelling that will enable them to understand the structure and functioning of ecosystems and to make reliable predictions of their behaviour. Students will acquire methodological skills needed to build a qualitative and quantitative ecological models that will allow them to gain new knowledge about the behaviour of the studied ecosystems (models for explanation), to predict their behaviour (predictive models) and to build models for the management of these systems (decision support models).

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študenti bodo sposobni uporabljati obravnavane metode in orodja ekološkega modeliranja na praktičnih primerih.	Knowledge and understanding: Students will be able to apply studied modelling methods and tools on particular research cases.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predmet sestavljajo predavanja, vaje in seminar. Vsakem vsebinskemu sklopu predavanj sledijo računalniške vaje o uporabi specifičnih orodij za ekološko modeliranje (STELLA, WEKA, DEXi). Študenti rezultate predstavijo v seminarski nalogi.	The course consists of lectures, exercises and seminar work. Each part of the lecture is followed by exercises about the application of particular modelling tools (e.g., STELLA, WEKA, DEXi). Students present their results in a seminar work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
- Uspešna predstavitev seminarske naloge. - Pisni izpit. - Končno oceno sestavlja: 40% pisni izpit, 60% seminarska naloga.	Pisni izpit/written exam: 40% Seminar/seminar work:60%	- Successful presentation of a seminar work. - Written exam. - Final assessment consists of: 40% written exam, 60% seminar work.

Reference nosilca / izvajalcev / Lecturer's references:

Debeljak Marko

1. DEBELJAK, Marko, POLJANEC, Aleš, ŽENKO, Bernard. Modelling forest growing stock from inventory data : a data mining approach. Ecological indicators, ISSN 1470-160X, jun. 2014, vol. 41, str. 30-39, doi: 10.1016/j.ecolind.2014.01.010. [COBISS.SI-ID 27499559]

2. DEBELJAK, Marko, TRAJANOV, Aneta, STOJANOVA, Daniela, LEPRINCE, Florence,

DŽEROSKI, Sašo. Using relational decision trees to model out-crossing rates in a multi-field setting. V: JORDÁN, Ferenc (ur.), SCOTTI, Marco (ur.). Proceedigs of the 7th ECEM, European Conference on Ecological Modelling, 30 May - 2 June 2011, Riva el Garda, Italy, (Ecological modelling, ISSN 0304-3800, vol. 245, 2012). Amsterdam: Elsevier, 2012, vol. 245, str. 75-83, doi: 10.1016/j.ecolmodel.2012.04.015. [COBISS.SI-ID 25848103]

3. CORTET, Jérôme, KOCEV, Dragi, DUCOBU, Caroline, DŽEROSKI, Sašo, DEBELJAK, Marko, SCHWARTZ, Christophe. Using data mining to predict soil quality after application of biosolids in agriculture. Journal of environmental quality, ISSN 0047-2425, 2011, vol. 40, no. 6, str. 1972-1982, doi: 10.2134/jeq2011.0155. [COBISS.SI-ID 25336615]

4. DEBELJAK, Marko, SQUIRE, Geoff R., KOCEV, Dragi, HAWES, Cathy, YOUNG, Marc W., DŽEROSKI, Sašo. Analysis of time series data on agroecosystem vegetation using predictive clustering trees. V: LAROCQUE, Guy R. (ur.). Proceedigs of the Ecological modelling for enhanced sustainability in management, ISEM 2009, October 6-9, 2009, Québec, Canada, (Ecological modelling, ISSN 0304-3800, vol. 222, no. 14, 2011). Amsterdam: Elsevier, 2011, vol. 222, no. 14, str. 2524-2529, doi: 10.1016/j.ecolmodel.2010.10.021. [COBISS.SI-ID 24218407]
5. TRAJANOV, Aneta, TODOROVSKI, Ljupčo, DEBELJAK, Marko, DŽEROSKI, Sašo. Modelling the outcrossing between genetically modified and conventional maize with equation discovery.Ecological modelling, ISSN 0304-3800. [Print ed.], 2009, vol. 220, no. 8, str. 1063-1072. [COBISS.SI-ID 22574375]

6. DEBELJAK, Marko, KOCEV, Dragi, TOWERS, W., JONES, M., GRIFFITHS, Bryan, HALLETT, P. Potential of multi-objective models for risk-based mapping of the resilience characteristics of soils : demonstration at a national level. Soil use and management, ISSN 0266-0032, 2009, vol. 25, no. 1, str. 66-77. [COBISS.SI-ID 22691623]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Raziskave v gozdni fitocenologiji in gojenju gozdov**
Course title:	**Research in Forest Phytosociology and Silviculture**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20	**30**	**20**	**/**	**10**	**170**	**10**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Jurij Diaci

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

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

Raziskave gozdnih rastišč: Srednjeevropska metoda proučevanja gozdne vegetacije in primerjava z drugimi metodami (Grime-ove strategije, uporaba funkcionalnih znakov), metode statistične obdelave floristčnih in vegetacijskih podatkov (npr. klasifikacija, ordinacija), fitoindikacija (pojavljanje posameznih rastlinskih vrst glede na okoljske parametre), sekundarne sukcesije po motnjah, tekoči raziskovalni dosežki, vrednotenje gozdnih rastišč, interdisciplinarni pristopi, uporaba raziskovalnih metod pri analizi in napovedovanju razvoja vegetacije. Eksperimentalno gojenje gozdov: Posebnosti raziskovalnega dela v gojenju gozdov in presoja aktualnih raziskav v Sloveniji in svetu. Pomen in meritve izbranih ekoloških dejavnikov v gozdovih. Uporaba ekološkega modeliranja v gojenju gozdov. Ekologija sestojnih vrzeli. Alternacija drevesnih vrst. Posebnosti raziskovalnega dela v pragozdovih, varovalnih in visokogorskih gozdovih. Trajne raziskovalne ploskve, primeri dobrih praks, bodoči razvoj gojenja gozdov.	Research into forest habitats: Central European method of studying forest vegetation and comparison with other methods (Grime's strategies, use of functional markers), methods of statistical processing of floristic and vegetational data (e.g., classification, ordination), phytoindication (appearance of individual plants species in relation to environmental parameters), secondary succession after disturbance, current research achievements, evaluating forest habitats, interdisciplinary approaches, use of research methods in the analysis and prognosis of the development of vegetation. Experimental silviculture: Characteristics of research work in silviculture and assessment of current research in Slovenia in the world. Importance and measurement of selected ecological factors in forests. Application of ecological modelling in silviculture. Ecology of canopy gaps. Alternation of tree species. Particularities of research work in old-growth, protective and high mountain forests. Permanent research plots, examples of good practice, future development of silviculture.

Temeljni literatura in viri / Readings:

Barnes, B.V., Zak, D.R., Denton, S.R., Spurr, S.H., 1998. Forest ecology. John Wiley & Sons, New York.
Kimmins, J.P., 1997. Forest Ecology: A Foundation for Sustainable Management. Prentice Hall, Upper Saddle River, New Jersey.
Smith, D.M., Larson, B.C., Kelthy, M.J., Ashton, P.M.S., 1997. The practice of silviculture: applied forest ecology. John Wiley & Sons, inc., New York.
Smith,T.M., Shugart, H.H. & Woodward F.I. 1997. Plant Functional Types. Cambridge University Press, Cambridge, 369 s.
Van der Marel, E., 2005. Vegetation Ecology; Blackwell Science Ltd., 395 s.
revijalni članki s področja, tekoča periodika, druga učna gradiva …

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilj so: nadgraditi temeljna znanja na področjih ekologije gozdov, gozdne fitocenologije in gojenja gozdov; z diskusijami o sodobnih ekoloških paradigmah in teorijah poglobiti razumevanje temeljnih mehanizmov in procesov v gozdnih ekosistemih ter spoznati vpliv gospodarjenja na njihovo zgradbo in delovanje.	Educational aims: to develop the basic knowledge in the fields of forest ecology, phytocenology and silviculture; with discussions on contemporary ecological paradigms and theories to deepen understanding of the basic mechanisms and processes in forest ecosystems and to recognise the influence of management on their structure and functioning.
Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: usposobiti slušatelje za samostojno zahtevnejše strokovno in osnovno raziskovalno delo na področju gozdne fitocenologije in gojenja gozdov. Poudarek je na razvijanju sposobnosti kritične presoje raziskovalnega dela in znanstvenih objav, v zaznavanju razvojnih in raziskovalnih problemov, izbiri primernih metod in pripravi predlogov raziskovalnih projektov; razumevanje načinov povezovanja pedagoškega, raziskovalnega in razvojnega dela ter poznavanje pomena dolgoročnih raziskav in trajnih raziskovalnih ploskev.	Knowledge and understanding: to qualify students for independent demanding developmental and elementary research work within scientific fields of forest ecology, phytocenology and silviculture. The stress is on developing the capacity for critical assessment of research results and scientific publications, characterising development and research problems, choice of suitable methods and preparation of proposals of research projects; understanding methods of linking pedagogic, research and development work and recognising the importance of long-term research and permanent research plots.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja s sodelovalnim, refleksivnim učenjem / poučevanjem in diskusijo. Vodeno seminarsko delo v kabinetu in na terenu. Poudarek je na sprotnem učenju in sodelovanju. Končni izpit se opravlja neposredno po opravljenih kontaktnih urah. Sprotno ocenjevanje dosežkov stimulira študenta k rednem delu.	Lectures with participative, reflexive teaching/learning and discussions. Guided seminar work indoors and in the field. The stress is on simultaneous teaching and participation. The final examination is taken immediately after contact hours have been completed. Simultaneous assessment of achievements stimulates students for regular work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Končna ocena izpita je sestavljena iz: (1) poprečne ocene sodelovanja na predavanjih / konzultacijah dveh sklopov (2) poprečne ocene dveh seminarskih nalog in (3) zaključnega pisnega izpita.	 (25%) (25%) (50%)	The final grade of the subject consists of: (1) average grade for participation at lectures of the two modules (2) average grade for two seminar assignments and (3) final written examination.

Reference nosilca / Lecturer's references:

Prof. dr. Jurij Diaci

Lukáš BÍLEK, Jiří REMEŠ, Vilém PODRÁZSKÝ, Dusan ROZENBERGAR, Jurij DIACI, Daniel ZAHRADNÍK. Gap regeneration in near-natural European beech forest stands in Central Bohemia – the role of heterogeneity and micro-habitat factors. Dendrobiology 2014, vol. 71:59-71
kategorija: 1A3 (Z1)

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.
kategorija: 1A1 (Z1, A', A1/2)

RUGANI, Tihomir, DIACI, Jurij, HLADNIK, David. Gap dynamics and structure of two old-growth beech forest remnants in Slovenia. PloS one, ISSN 1932-6203, 2013, vol. 8, iss. 1, 13 str. http://dx.doi.org/10.1371/journal.pone.0052641
kategorija: 1A1 (Z1, A', A1/2)

ROZMAN, Andrej, VAJDETIČ, Alen, DIACI, Jurij. Šumski rezervat jele (Abies alba Mill.) u sekundarnoj sukcesiji na opuštenim pašnjacima Poljanske doline u Sloveniji = A protected Silver fir (Abies alba Mill.) stand in secondary succession on a former pasture in Poljanska dolina, Slovenia. Šumarski list, ISSN 0373-1332, 2013, god. 137, br. 3/4, str. 135-146.
kategorija: 1A4 (Z1)

ROŽENBERGAR, Dušan, KOLAR, Uroš, ČATER, Matjaž, DIACI, Jurij. Comparison of four methods for estimating relative solar radiation in managed and old-growth silver fir-beech forest. Dendrobiology, ISSN 1641-1307, 2011, vol. 65, no. 1, str. 73-82, ilustr.
kategorija: 1A3 (Z1)

MARINŠEK, Aleksander, DIACI, Jurij. A comparison of structural characteristics and ecological factors between forest reserves and managed silver fir - norway spruce forest in Slovenia. Ekológia, ISSN 1335-342X, 2011, vol. 30, no. 1, str. 51-66, ilustr
kategorija: 1A4 (Z1)

DIACI, Jurij, FIRM, Dejan. Long-term dynamics of a mixed conifer stand in Slovenia managed with a farmer selection system. Forest Ecology and Management, ISSN 0378-1127. [Print ed.], 2011, vol. 262, no. 6, str. 231-239, ilustr.
kategorija: 1A1 (Z1, A', A1/2)

DIACI, Jurij, ROŽENBERGAR, Dušan, ANIĆ, Igor, MIKAC, Stjepan, SANIGA, Milan, KUCBEL, Stanislav, VIŠNJIĆ, Ćemal, BALLIAN, Dalibor. Structural dynamics and synchronous silver fir decline in mixed old-growth mountain forests in Eastern and Southeastern Europe. Forestry, ISSN 0015-752X, 2011, vol. 84, no. 5, 479-491, ilustr.
kategorija: 1A2 (Z1, A1/2)

VILHAR, Urša, STARR, Michael, KATZENSTEINER, Klaus, SIMONČIČ, Primož, KAJFEŽ-BOGATAJ, Lučka, DIACI, Jurij. Modelling drainage fluxes in managed and natural forests in the Dinaric karst: a model comparison study. European journal of forest research (Print), ISSN 1612-4669, 2010, vol. 129, no. 4, str. 729-740, ilustr.
kategorija: 1A1 (Z1, A', A1/2)

DIACI, Jurij, ROŽENBERGAR, Dušan, BONČINA, Andrej. Stand dynamics of Dinaric old-growth forest in Slovenia : are indirect human influences relevant?. Plant Biosystems, ISSN 1126-3504, 2010, vol. 144, no. 1, 194-201, ilustr.
kategorija: 1A1 (Z1, A', A1/2)

NAGEL, Thomas Andrew, SVOBODA, Miroslav, RUGANI, Tihomir, DIACI, Jurij. Gap regeneration and replacement patterns in an old-growth Fagus-Abies forest of Bosnia-Herzegovina. Plant ecology, ISSN 1385-0237, 2010, vol. 208, no. 2, str. 307-318, ilustr.
kategorija: 1A1 (Z1, A', A1/2)

FIRM, Dejan, NAGEL, Thomas Andrew, DIACI, Jurij. Disturbance history and dynamics of an old-growth mixed species mountain forest in the Slovenian Alps. Forest Ecology and Management, ISSN 0378-1127. [Print ed.], 2009, vol. 257, no. 9, str. 1893-1901, ilustr
kategorija: 1A1 (Z1, A', A1/2)

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Raziskave v gozdni mikologiji: pomen in uporaba gliv**
Course title:	**Research on forest mycology: significance and application of fungi**

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
10	**25**	**/**	**/**	**10**	**80**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Dušan Jurc

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

Vsebina:	Content (Syllabus outline):
Predmet bo obsegal izbrane teme iz sistematike, genetike, ekologije in uporabe zaprtotrosnic, prostotrosnic, nepopolnih gliv in glivolikih alg. Predavanja bodo obsegala življenjske kroge, sistematiko, ekologijo, genetiko in praktično uporabo glavnih debel kraljestva gliv. Izbrane teme študija bodo odvisne od usmeritve študenta in bodo obsegale: glivne združbe, glivne populacije in habitati in njihova karakterizacija, molekularne tehnike za uporabo v sistematiki in pri analizah glivnih populacij, glivna razgradnja rastlinskih materialov, razgrajevalke lignina in celuloze, pomen razgrajevalk lesa v gozdnem ekosistemu, razkrojevalke pesticidov in plastike, endosimbioza – detekcija endofitov v rastlinskem materialu in njihova taksonomija, endofitni mutualizem, okužba in učinki na žuželke in herbivore, reakcije z endofiti okuženih rastlin na mikrobne patogene in strategije endofitov, splošni pregled vpliva mikorize v gozdnem ekosistemu, sukcesije mikoriznih gliv, ektomikorize, erikoidne, arbutoidne in monotropoidne mikorize, detekcija in diagnoza patogenov rastlin – izbor gostiteljev, simptomatologija, morfologija povzročitelja bolezni, selektivni mediji, biokemični markerji – metabolizem substrata, serološke tehnike, tehnike z uporabo nukleinskih kislin, izbira diagnostičnih tehnik, mikrobiološke tehnike – izolacija, gojenje v laboratoriju (priprava gojišč, inokulacija, inkubacija), kontrola rasti (principi sterilnega dela – sterilizacija, higiena in metode dela), mikroskopija in barvanje vzorcev, ekstrakcija sekundarnih metabolitov z različnimi metodami – kvalitativna in kvantitativna ocena.	The course will consist of selected topics concerning the systematics, genetics, ecology, and applications of ascomycetes, basidiomycetes, deuteromycetes and water moulds. Lectures will cover life histories, systematics, ecology, genetics, and practical applications of major phyla of Kingdom Fungi. Selected topisc will depend on the student interest: fungal community, fungal population in habitats and their characterization, Molecular techniques to analyze fungal population, Fungal degradation of plant materials, lignin and cellulose degrading fungi, importance of wood decay fungi in forest ecosystem. Fungal degradation of pesticides, plastic and heritage materials. Endosymbiosis – detection of endophytes of plants and their taxonomy, endophytic mutualism, endophytic infections, effects on insects and herbivores, reaction of endophyte-associated plants to microbial pathogens and endophytic strategies. General overview of the role of ectomycorhriza in forest ecosystems, successions of mycorrhizal fungi,Ectomycorrhizae, Ericoid, Arbutoid and Monotropoid mycorrhizae. Detection and diagnosis of plant pathogenesis- host range and symptomatology, morphology of the causal organism, selective media, biochemical markers-substrate metabolism, serological techniques, nucleic acid techniques, choice of diagnostic techniques.Microbiological methods-isolation, laboratory culture (media preparation, inoculation, incubation); microbial growth control (principles of asepsis- sterilization, sanitation and methods thereof), microscopy and staining of samples, extraction of secondary metabolites through different methods -qualitative and quantitative estimation.

Temeljni literatura in viri / Readings:

- JURC D., PILTAVER A., OGRIS N., 2005. Glive Slovenije : vrste in razširjenost = Fungi of Slovenia : species and distribution. Studia forestalia Slovenica, 124. Ljubljana: Gozdarski inštitut Slovenije, Silva Slovenica: 497 str., ISBN 961-6425-24-2.
- WEBSTER J., EEBBER R., 2007. Introduction to fungi. Cambridge University Press; 2 edition: 841 str., ISBN: 978-0-521-01483-0
- SINCLAIR W.A., LYON H.H., JOHNSON W.T., 1987. Diseases of Trees and Shrubs.- Comstock Publ. Assoc., Cornell U. Press, Ithaca, N.Y., 574 str.
- revijalni članki s področja,
- tekoča periodika, druga učna gradiva

Cilji in kompetence:	**Objectives and competences:**
Izobraževanje za sposobnost determinacije in razumevanja najpomembnejših gliv v gozdnem okolju, njihov pomen v ekosistemu, njihovo uporabo in njihove biološke značilnosti. Uvod v najustreznejše metode v mikologiji in pri raziskavah gliv.	Educational goals and anticipated study results: training for determinatoin and understanding of most important fungi in forest environment, their role in ecosystem, use and their biological characteristics. Introduction to the most appropriate methods in mycology and research on fungi.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent bo pridobil teoretična in praktična znanja v zvezi z izolacijo, identifikacijo in ekološkim pomenom pogostih glivnih rodov ali vrst v gozdnem ekosistemu. Osvojil bo tradicionalne tehnike v gozdni mikologiji in nove pristope, ki temeljijo na najpomembnejših morfoloških, fizioloških in biokemičnih značilnostih.	Knowledge and understanding: Students will acquire theoretical as well as practical knowledge concerning isolation, identification and the ecological role of common fungal genera/species important in forest ecosystem. They will master the techniques traditionally used in forest mycology and the novel approaches based on principal morphological, physiological and biochemical characteristics.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja bodo obsegala življenjske kroge, sistematiko, ekologijo genetiko in praktično uporabo vseh pomembnih debel gliv. Prezentacije bodo osredotočene na anatomijo, morfologijo in taksonomijo teh gliv. Obisk v laboratoriju bo vključeval mikroskopijo, laboratorijsko delo, tehnike sterilnega dela in gojenja gliv.	Lectures will cover life histories, systematics, ecology, genetics, and practical applications of all major phylla of fungi. Power point presentations will focus on anatomy, morphology, and taxonomy of these fungi. Laboratory visit will include microscopy, work in the laboratory, sterile techniques and fungal culture.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni ali ustni izpit z ocenjevanjem posameznih vprašanj (1-5 točk). Študent lahko doseže 20 točk – pod 10 točkami je ocenjen negativno, nad 10 točkami je ocenjen pozitivno. Končna ocena je tehtana sredina izpita (80%) in seminarske naloge (20%).	80 20	**Written or oral examination** with scoring of individual questions (1-5 points). One can reach 20 points, under 10 points - the assessment is negative (1-5), over 10 points a positive. Final evaluation of the course is weighted arithmetic mean of the assessment exam (80%) and assessment of seminar work (20%).

Reference nosilca / izvajalcev / Lecturer's references:

Prof. dr. Dušan Jurc

HAUPTMAN, Tine, PIŠKUR, Barbara, DE GROOT, Maarten, OGRIS, Nikica, FERLAN, Mitja, JURC, Dušan. Temperature effect on Chalara fraxinea : heat treatment of saplings as a possible

disease control method. Forest pathology, ISSN 1439-0329, 2013, vol. 43, no. 5, str. 360-370, ilustr. http://dx.doi.org/10.1111/efp.12038, doi: 10.1111/efp.12038. [COBISS.SI-ID 3567782], [JCR, SNIP, WoS do 4. 11. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 19. 12. 2013: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0.33, normirano št. čistih citatov (NC): 2]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 16.91, št. avtorjev: 6

SANTINI, Alberto, JURC, Dušan, et al. Biogeographical patterns and determinants of invasion by forest pathogens in Europe. The New phytologist, ISSN 0028-646X, 2013, vol. 197, no. 1, str. 238-250, ilustr. http://dx.doi.org/10.1111/j.1469-8137.2012.04364.x, doi: 10.1111/j.1469-8137.2012.04364.x. [COBISS.SI-ID 3474598], [JCR, SNIP, WoS do 19. 2. 2014: št. citatov (TC): 13, čistih citatov (CI): 12, čistih citatov na avtorja (CIAu): 0.80, normirano št. čistih citatov (NC): 6, Scopus do 12. 2. 2014: št. citatov (TC): 19, čistih citatov (CI): 18, čistih citatov na avtorja (CIAu): 1.21, normirano št. čistih citatov (NC): 9]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 12.06, št. avtorjev: 31

JURC, Maja, BOJOVIC, Srdjan, FERNÁNDEZ, Mercedes Fernández, JURC, Dušan. The attraction of cerambycids and other xylophagous beetles, potential vectors of Bursaphelenchus xylophilus, to semio-chemicals in Slovenia. Phytoparasitica, ISSN 0334-2123, 2012, vol. 40, no. 4, str. 337-349, ilustr. http://dx.doi.org/10.1007/s12600-012-0234-4, doi: 10.1007/s12600-012-0234-4. [COBISS.SI-ID 3368358], [JCR, SNIP, WoS do 5. 2. 2014: št. citatov (TC): 2, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.25, normirano št. čistih citatov (NC): 1, Scopus do 29. 1. 2014: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.25, normirano št. čistih citatov (NC): 1]
kategorija: 1A3 (Z1); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 15.8, št. avtorjev: 4

PIŠKUR, Barbara, BAJC, Marko, ROBEK, Robert, HUMAR, Miha, SINJUR, Iztok, KADUNC, Aleš, OVEN, Primož, REP, Gregor, AL SAYEGH-PETKOVŠEK, Samar, KRAIGHER, Hojka, JURC, Dušan, POHLEVEN, Franc. Influence of Pleurotus ostreatus inoculation on wood degradation and fungal colonization. Bioresource technology, ISSN 0960-8524. [Print ed.], vol. 102, iss. 22, str. 10611-10617, ilustr. http://dx.doi.org/10.1016/j.biortech.2011.09.008, doi: 10.1016/j.biortech.2011.09.008. [COBISS.SI-ID 3235494], [JCR, SNIP, WoS do 10. 1. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 20. 3. 2013: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.09, normirano št. čistih citatov (NC): 1]
kategorija: 1A1 (Z1, A'', A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 15.75, št. avtorjev: 12

PIŠKUR, Barbara, PAVLIC, D., SLIPPERS, B., OGRIS, Nikica, MARESI, Giorgio, WINGFIELD, Michael J., JURC, Dušan. Diversity and pathogenicity of Botryosphaeriaceae on declining Ostrya carpinifolia in Slovenia and Italy following extreme weather conditions. European journal of forest research (Print), ISSN 1612-4669, 2011, vol. 130, no. 2, str. 235-249, ilustr. http://dx.doi.org/10.1007/s10342-010-0424-x, doi: 10.1007/s10342-010-0424-x. [COBISS.SI-ID 2992550], [JCR, SNIP, WoS do 28. 1. 2014: št. citatov (TC): 5, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 0.71, normirano št. čistih citatov (NC): 5, Scopus do 1. 1. 2014: št. citatov (TC): 5, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 0.71, normirano št. čistih citatov (NC): 5]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 16.06, št. avtorjev: 7

OGRIS, Nikica, HAUPTMAN, Tine, JURC, Dušan, FLOREANCIG, Valentino, MARSICH, F., MONTECCHIO, Lucio. First report of Chalara fraxinea on common ash in Italy. Plant disease, ISSN 0191-2917, 2010, vol. 94, no. 1, str. 133. http://dx.doi.org/10.1094/PDIS-91-12-1579, doi: 10.1094/PDIS-94-1-0133A. [COBISS.SI-ID 2484902], [JCR, SNIP, WoS do 5. 11. 2013: št. citatov (TC): 8, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 1.17, normirano št. čistih citatov (NC): 4, Scopus do 3. 12. 2013: št. citatov (TC): 10, čistih citatov (CI): 9, čistih citatov na avtorja (CIAu): 1.50, normirano št. čistih citatov (NC): 5]
kategorija: 1A1 (Z1, A', A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 16.8, št. avtorjev: 6

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Raziskovalne metode v ekologiji in upravljanju prostoživečih živali**
Course title:	**Research methods used in wildlife ecology and management**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**25**	**/**	**/**	**10**	**80**	**5**

Nosilec predmeta / Lecturer:	Nosilec: doc. dr. Klemen Jerina

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Kandidatovo raziskovalno področje se vsaj deloma pokriva s področjem upravljanja in raziskav prostoživečih živalskih vrst. Osnovna predznanja statičnih metod (na do-diplomskem ali podiplomskem študiju končan vsaj en predmet, ki pokriva osnovne statistične metode)	Candidate's study topic is at least partly connected with wildlife research and management. Basic knowledge of statistical methods (completed at least one course on basic statistics during under- or post-graduate study).

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

Pregled glavnih raziskovalnih pristopov in metod, ki se uporabljajo pri sodobnem raziskovanju in upravljanju prostoživečih živali, zlasti večjih zavarovanih vrst in divjadi, s poudarkom na vsebinah, ki so pomembne za pripravo doktorske disertacije slušatelja. Prostorski podatki: pomeni, dostopnost, viri, vsebine, načini in možnosti pridobivanje, priprava in obdelava, programi za obdelavo, najpogostejši protokoli za pripravo in obdelavo, kriging, primeri uporabe. Metode spremljanja gibanja, aktivnosti in rabe prostora živali: (i) cilji in dometi posameznih metod, (ii) VHF in GPS telemetrija: odlov, in spremljanje živali, nabor možnih spremljanih podatkov, optimizacija zajema podatkov glede na cilje raziskave (iii) spremljanje z avtomatskimi foto- in video kamerami (foto-pasti): uporabnost in primeri rabe metode, omejitve metode, optimizacija zajema podatkov glede na cilje raziskave, (iv) analitske metode pri preučevanju gibanja, aktivnosti in rabe prostora Metode za določanje lokalnih gostot, številčnosti in populacijske dinamike izbranih živalskih vrst: (i) pregled izhodiščnih podatkov in metod za posamezne skupine, prednosti in slabosti: štetje kupčkov iztrebkov, podatki o odvzemu, foto-pasti, oglašanje, sledi in drugi posredni znaki prisotnosti, neinvazivna genetika, (ii) metoda ulova, markiranja in ponovnega ulova, predpostavke, omejitve, statistični modeli, (iii) rekonstrukcija številčnosti, spolne in starostne sestave ter populacijske dinamike na osnovi podatkov o spolni in starostni sestavi evidentirane smrtnosti, kohortna analiza Metode za raziskovanje prehrane, plenjenja in prehranjevalnega vedenja: pregled najpogostejših metod, njihove prednosti in slabosti: analiza iztrebkov in vsebine prebavil (vključno z analizo vzorcev kutikule dlak in mikrostrukture perja za določanje vrstne pripadnosti), spremljanje stopnje plenjenja s pomočjo sledenja in VHF ali GPS telemetrije, spremljanja konzumacije hrane s foto-pastmi, analiza ostankov plena (fizična kondicija, demografski podatki)	Overview of main research methods and approaches used in modern wildlife research and management. Focused on large protected species and game animals and on content that is important for preparation of the candidate's doctorate thesis. Spatial data: importance, availability, sources, content, possibilities and approaches for data acquisition, data preparation and manipulation, softwares used, main protocols for data processing, kriging, examples of usage. Methods for monitoring animal movement, activity and space use: (i) goals and possibilities of different methods, (ii) VHF and GPS telemetry: animal capture and monitoring, possible data types to be collected, optimisation of data acquisition in regard to study goals, (iii) use of automatic cameras (photo- and video-traps): usage and examples of its use, limitations, optimisation of data acquisition in regard to study goals, (iv) analytic methods for studying animal movement, activity and space use Methods for estimating local densities, abundances and population dynamics of selected animal species: (i) overview of potential data and methods for various groups of animals, advantages and drawbacks: pellet group counting, removal data, camera-traps data, vocalizations, tracks and other indirect signs of presence, non-invasive genetics, (ii) capture-mark-recapture methods, assumptions, limitations, statistical models, (iii) reconstruction of abundance, demographic structure and population dynamics based on demographic data from recorded mortality, cohort analysis Methods for studying diet, predation and feeding behaviour: overview of main methods with their advantages and drawbacks: analysis of scats and digestive tract content (including analysis of hair and feather microstructure used for species recognition), estimating predation rate with the use of tracking and VHF or GPS telemetry, monitoring of feeding behaviour with camera-traps, analysis of prey remains (physical condition, demographic data) Methods and raw data for measuring natality and other indicators of population vitality for

Metode in izhodiščni podatki za določanja rodnosti in drugih kazalnikov vitalnosti živalskih vrst: pregled podatkov in metod po skupinah vrst, prednosti in slabosti: telesna masa, dolžina čeljusti ali drugih delov skeleta, vsebnost maščevja v kostnem mozgu in drugi podatki o odvzetih živali, metode za določanje oplojenosti pri odvzetih osebkih Metode za preučevanja odnosov javnosti do prostoživečih živali: kvantitativne in kvalitativne metode socialne psihologije, metode raziskovanja stališč, fokusne skupine, globinski intervjuji	various animal groups: overview of available data and methods for different animal groups, advantages and drawbacks: body mass, length of lower jaw and other skeletal parts, marrow-fat index and other data from removed animals, methods for estimating fertility in removed animals Methods for studying public attitude towards wildlife species: quantitative and qualitative methods of social psychology, methods for studying public opinion, focus groups, in-depth interviews

Temeljni literatura in viri / Readings:

Krebs, C.J. 1999. Ecological Methodology, 2nd ed. Addison-Wesley Educational Publishers, Inc,.620 str

Izbrane monografije (znanstveni priročniki) in članki iz znanstvenih publikacij, ki pokrivajo kandidatovo raziskovalno področje.

Selected monographs (expert guidelines) and scientific papers related to candidate's field.

Cilji in kompetence:	**Objectives and competences:**
Cilji bodo povsem prilagojeni izbrani temi in raziskovalnem področju slušatelja. Slušatelj bo pridobil pregled nad naborom obstoječih in možnosti pridobivanja novih podatkov in metod, ki se uporabljajo na njegovem področju in so aktualne za izdelavo njegove naloge. Poleg tega bo eno ali nekaj izbranih metod (v dogovoru z mentorjem) osvojil v meri, da jo/jih bo zmožen uporabljati.	Objectives will be adapted to the candidate's research field. Candidate will gain overview of available data and approaches for acquisition of new data, as well as of methods used in given field that are important in preparation of his/her thesis. Candidate will (in agreement with his/her supervisor) become familiar with one of the selected methods to the level to be able to use it independently.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Kandidat spozna glavne analitske metode in postopke za zajem podatkov, ki se uporabljajo na področju raziskav in upravljanja prostoživečih živalskih vrst in se eno ali nekaj metod, ki so ciljno izbrane za njegovo področje, nauči uporabljati.	Knowledge and understanding: Candidate will gain an overview of main analytic methods and approaches used for acquisition of data needed in wildlife research and management. He/she will be able to independently use one or several methods needed for his/her research.

Metode poučevanja in učenja:	Learning and teaching methods:
- vsebine se v veliki meri prilagodijo raziskovalnemu interesu kandidata/kandidatke. - predavanja (izbrane vsebine) in priprava vodenega seminarja, - v primeru večjega števila slušateljev, ki jih zanimajo iste vsebine (npr. uporaba GIS orodij) izvedba praktikuma, - konzultacije, terensko delo, vključitev v raziskovalni projekt. - glavnino naštetih vsebin predmeta lahko pokrije nosilec, izbrane teme pa izbrani vabljeni predavatelji/raziskovalci	- content will be in large part adapted to the individual research interest of the candidate - lectures (selected topics) and preparation of guided seminar - practical course in case of larger number of candidates interested in the same topics (e.g. use of GIS tools) - consultations, field-work, involvement in research projects - majority of topics will be covered by the lecturer, other selected topics by guest lecturers/researchers

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Ocena pri predmetu je povprečje ocene seminarja in ocene na osnovi ustnega preverjanja znanja ob zaključni konzultaciji.	50 (seminar) 50 (ustni izpit)	Final grade will be an average of grades of the seminar and oral exam at the final consultation.

Reference nosilca / izvajalcev / Lecturer's references:

Klemen Jerina:

JERINA, Klemen, JONOZOVIČ, Marko, KROFEL, Miha, SKRBINŠEK, Tomaž. Range and local population densities of brown bear Ursus arctos in Slovenia. European journal of wildlife research, ISSN 1612-4642, 2013, vol. 59, issue 4, str. 459-467. http://link.springer.com/article/10.1007%2Fs10344-013-0690-2, doi: 10.1007/s10344-013-0690-2. [COBISS.SI-ID 2722639]

KROFEL, Miha, KOS, Ivan, JERINA, Klemen. The noble cats and the big bad scavengers : effects of dominant scavengers on solitary predators. Behavioral ecology and sociobiology, ISSN 0340-5443, 2012, vol. 66, no. 9, str. 1297-1304. http://dx.doi.org/10.1007/s00265-012-1384-6, doi: 10.1007/s00265-012-1384-6. [COBISS.SI-ID 2609231]

SKRBINŠEK, Tomaž, JELENČIČ, Maja, WAITS, Lisette, KOS, Ivan, JERINA, Klemen, TRONTELJ, Peter. Monitoring the effective population size of a brown bear (Ursus arctos) population using new single-sample approaches. Molecular ecology, ISSN 0962-1083, 2012, vol. 21, no. 4, str. 862-875, doi: 10.1111/j.1365-294X.2011.05423.x. [COBISS.SI-ID 29447897]

GÜTHLIN, Denise, KNAUER, Felix, KNEIB, Thomas, KÜCHENHOFF, Helmut, KACZENSKY, Petra, RAUER, Georg, JONOZOVIČ, Marko, MUSTONI, Andrea, JERINA, Klemen. Estimating habitat suitability and potential population size for brown bears in the Eastern Alps. Biological Conservation, ISSN 0006-3207. [Print ed.], 2011, vol. 144, no. 5, str. 1733-1741, ilustr. http://dx.doi.org/10.1016/j.biocon.2011.03.010, doi: 10.1016/j.biocon.2011.03.010. [COBISS.SI-ID 3150502]

KACZENSKY, Petra, JERINA, Klemen, JONOZOVIČ, Marko, KROFEL, Miha, SKRBINŠEK, Tomaž, RAUER, Georg, KOS, Ivan, GUTLEB, Bernhard. Illegal killings may hamper brown bear recovery in the Eastern Alps. Ursus, ISSN 1537-6176, 2011, vol. 22, no. 1, str. 37-46, ilustr. http://dx.doi.org/10.2192/URSUS-D-10-00009.1, doi: 10.2192/URSUS-D-10-00009.1. [COBISS.SI-ID 3150246]

JERINA, Klemen. Roads and supplemental feeding affect home-range size of Slovenian red deer

more than natural factors. Journal of mammalogy, ISSN 0022-2372, 2012, vol. 93, no. 4, str. 1139-1148, ilustr. http://dx.doi.org/10.1644/11-MAMM-A-136.1, doi: 10.1644/11-MAMM-A-136.1. [COBISS.SI-ID 3427238]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Upravljanje gozdnih ekosistemov**
Course title:	**Forest ecosystem management**

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
20	**70**	**/**	**/**	**/**	**160**	**10**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Andrej Bončina

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

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

Koncepti in metode upravljanja gozdnih ekosistemov. Večnamensko in trajnostno upravljanje. Kontrolna in druge metode upravljanja. Upravljanje s tveganji. Participacija. Upravljanje gozdnega prostora. Funkcije. Ekosistemske storitve. Rabe gozda. Prednostna območja. Zaraščanje in krčitve. Struktura in razvoj gozdnih sestojev. Viri podatkov. Sestojna dinamika. Rast. Modeliranje, spremembe na krajinski in regionalni ravni. Vplivni dejavniki. Upravljanje gozdnih sestojev. Načrtovanje, spremljava, analiza gospodarjenja. Večnamensko gospodarjenje. Primeri. Upravljanje voda v gozdnem prostoru. Celostno upravljanje z vodami v gozdnatih povirjih in hudourniških območjih in gozdna hidrologija. Upravljanje populacij živalskih vrst. Načrtovanje. Spremljanje. Orodja. Prepoznavanje deležnikov in njihovih potreb. Vključevanje deležnikov. Optimizacija učinkov od populacij divjadi. Večnamensko upravljanje. Posebnosti upravljanja zavarovanih vrst. Ohranjanje narave/biodiverzitete v gozdnem prostoru. Gozdovi in okolje. Primeri upravljanja. Zasebni gozdovi. Varovalni gozdovi. Natura 2000. Urbani gozdovi. Prebiralni gozdovi. Sanacije itn. Upravljavska orodja. Viri podatkov. Metode pridobivanja podatkov. Monitoringi. Informacijski sistemi. Primeri.	Concepts and methods of forest management. Multi-objective and sustainable forest management. Adaptive forest management. Risk management. Participation. Forest land-use management. Forest functions. Ecosystem services. Priority areas. Multiple forest land use. Changes of forest cover. Structure and development of forest stands. Data sources. Stand dynamics. Growth. Modelling. Changes at landscape and regional level. Influential factors. Forest management. Planning, monitoring, evaluation. Multi-objective forest management. Cases. Water management in forests. Integrated water management in forested watersheds and forest hydrology. Wildlife management. Planning. Monitoring. Tools. Identification of stakeholders and their interests. Involvement of stake-holders. Optimization of the effects of wildlife. Multi objective management. Specifics of management of protected species. Nature/biodiversity conservation. Forests and environment. Management cases. Private forests. Protection forests. Natura 2000 sites. Urban forests. Uneven-aged forests etc. Management tools. Data sources. Methods of collecting data. Monitoring. Information systems. Cases.

Temeljni literatura in viri / Readings:

Chang, M., 2013. Forest Hydrology – An Introduction to Water and Forests, 3rd Ed., CRC Press, Taylor and Francis Group, 569 str.

Kimmins, J. P., 1997. Forest ecology: A foundation for sustainable management. Prentice Hall, Upper Saddle River, New Jersey, 596 str.

Krausman, P.R., James, W.C (eds.).2003. Wildlife Management and Conservation: Contemporary Principles and Practices. Johns Hopkins University Press, 360 str.
Krebs, C.J. 1999. Ecological Methodology, 2nd ed. Addison-Wesley Educational Publishers, Inc,.620 str.

Naiman, R.J. (Ed.), 1992. Watershed Management: Balancing Sustainability and Environmental Change, Springer, 542 str.

Williams, B.K., Szaro, R.C., Shapiro, C.D., 2007. Adaptive management: the U.S. Department of the Interior. Technical guide. Adaptive working group, U.S. Department of the Interior, Washington, DC.

Tekoča znanstvena periodika. / Current scientific periodicals

Cilji in kompetence:

Temeljni cilji: osvojiti zasnovo celovitega upravljanja gozdnih ekosistemov, poglobiti znanja o upravljanju posameznih gozdnih virov in spoznati aktualne raziskovalne vsebine s področja upravljanja gozdnih ekosistemov.

Objectives and competences:

The main objective: to gain an insight into the concept of integral forest management (FM), to deepen knowledge on management of forest resources, to gain an insight into relevant research topics in the field of ecosystem forest management.

Predvideni študijski rezultati:

Znanje in razumevanje:
Kandidat spozna koncepte upravljanja gozdnih ekosistemov.
Seznani se z gozdnimi viri (gozdni sestoji, populacije živalskih in rastlinskih vrst, voda) in posebnostmi njihovega upravljanja.
Spozna trende, probleme in perspektive pri upravljanju gozdnih ekosistemov.
Spozna problematiko ohranjanja narave pri upravljanju gozdnih ekosistemov.
Seznani se z nekaterimi metodami in orodji za podporo upravljanju.

Intended learning outcomes:

Knowledge and understanding:
A student gets acquainted with the concept of ecosystem forest management, masters the model of adaptive forest management, is introduced to selected forest resources and their management.
A student is introduced to problems and perspectives in ecosystem forest management.
A student is acquainted with problems concerning nature conservation, and environmental management, and is introduced to some of the management tools.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja (izbrane vsebine), konzultacije, vodeni seminar, terensko delo, vključitev v raziskovalni projekt. Vsebine se delno prilagodijo raziskovalnemu interesu kandidata/kandidatke.	Lectures (selected chapters), guided seminars, lab work, fieldwork, participation in research projects. The content of the subject is adapted to the profile of PhD students.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ocena izpita je tehtano povprečje: 1) ocene seminarja in ocene raziskovalne uspešnosti ter 2) zaključnega pisnega izpita.	50% 50%	The final grade is an average of: 1) average grade of seminars, and 2) final written examination.

Reference nosilca / Lecturer's references:

Andrej Bončina

FICKO, Andrej, BONČINA, Andrej. Probabilistic typology of management decision making in private forest properties. *Forest Policy and Economics*, ISSN 1389-9341. [Print ed.], 2013, vol. 27, str. 34-43, ilustr. http://dx.doi.org/10.1016/j.forpol.2012.11.001, doi: 10.1016/j.forpol.2012.11.001. [COBISS.SI-ID 3495846]

BONČINA, Andrej, ČAVLOVIĆ, Juro, CUROVIC, Milic, GOVEDAR, Zoran, KLOPČIČ, Matija, MEDAREVIĆ, Milan. A comparative analysis of recent changes in Dinaric uneven-aged forests of the NW Balkans. *Forestry*, ISSN 0015-752X, 2013, vol. <v tisku>, no. <v tisku>, str. <v tisku>, ilustr. http://dx.doi.org/10.1093/forestry/cpt038, doi: 10.1093/forestry/cpt038. [COBISS.SI-ID 3740838]

SIMONČIČ, Tina, BONČINA, Andrej, ROSSET, C., BINDER, I., DE MEO, I., ČAVLOVIĆ, Juro, GAL, J., MATIJAŠIČ, Dragan, SCHNEIDER, J., SINGER, F., SITKO, R. Importance of priority areas for multi-objective forest planning : a Central European perspective. *The international forestry review*, ISSN 1465-5489, 2013, vol. 15, no. 4, str. 509-523, ilustr. http://dx.doi.org/10.1505/146554813809025685, doi: 10.1505/146554813809025685. [COBISS.SI-ID 3746470]

FICKO, Andrej, BONČINA, Andrej. Ensuring the validity of private forest owner typologies by controlling for response style bias and the robustness of statistical methods. *Scandinavian journal of forest research*, ISSN 0282-7581, 2013, vol. <v tisku>, no. <v tisku>, str. <v tisku>, ilustr. http://dx.doi.org/10.1080/02827581.2013.837194, doi: 10.1080/02827581.2013.837194. [COBISS.SI-ID 3702182]

KLOPČIČ, Matija, BONČINA, Andrej. Recruitment of tree species in mixed selection and irregular shelterwood forest stands. *Annals of forest science*, ISSN 1286-4560, 2012, vol. 69, no. 8, str. 915-925, ilustr. http://dx.doi.org/10.1007/s13595-012-0224-1, doi: 10.1007/s13595-012-0224-1. [COBISS.SI-ID 3421094]

KLOPČIČ, Matija, POLJANEC, Aleš, BONČINA, Andrej. Modelling natural recruitment of European beech (Fagus sylvatica L.). *Forest Ecology and Management*, ISSN 0378-1127. [Print ed.], 2012, vol. 284, str. 142-151, ilustr. http://dx.doi.org/10.1016/j.foreco.2012.07.049, doi: 10.1016/j.foreco.2012.07.049. [COBISS.SI-ID 3427494]

BONČINA, Andrej. Conceptual approaches to integrate nature conservation into forest management : a Central European perspective = Approches conceptuelles pour intégrer la conservation de la nature dans la gestion forestičre : une perspective dć Europe centrale = Enfoques conceptuales para la integración de la conservación de la naturaleza en la gestión forestal : una perspectiva centroeuropea. *The international forestry review*, ISSN 1465-5489, 2011, vol. 13, no. 1, str. 13-22, ilustr. http://dx.doi.org/10.1505/ifor.13.1.13, doi: 10.1505/ifor.13.1.13. [COBISS.SI-ID 3128742]

KLOPČIČ, Matija, JERINA, Klemen, BONČINA, Andrej. Long-term changes of structure and tree species composition in Dinaric uneven-aged forests : are red deer an important factor?. *European journal of forest research (Print)*, ISSN 1612-4669, 2010, vol. 129, no. 3, str. 277-288, ilustr. http://dx.doi.org/10.1007/s10342-009-0325-z, doi: 10.1007/s10342-009-0325-z. [COBISS.SI-ID 2480294]

POLJANEC, Aleš, FICKO, Andrej, BONČINA, Andrej. Spatiotemporal dynamic of European beech (Fagus sylvatica L.) in Slovenia, 1970-2005. *Forest Ecology and Management*, ISSN 0378-1127. [Print ed.], 2010, vol. 259, no. 11, str. 2183-2190, ilustr. http://dx.doi.org/10.1016/j.foreco.2009.09.022, doi: 10.1016/j.foreco.2009.09.022. [COBISS.SI-ID 2462630]

KLOPČIČ, Matija, BONČINA, Andrej. Patterns of tree growth in a single tree selection silver fir-European beech forest. *Journal of forest research*, ISSN 1341-6979, 2010, vol. 15, no. 1, str. 21-30, ilustr. http://dx.doi.org/10.1007/s10310-009-0157-1, doi: 10.1007/s10310-009-0157-1. [COBISS.SI-ID 2471590]

DIACI, Jurij, ROŽENBERGAR, Dušan, BONČINA, Andrej. Stand dynamics of Dinaric old-growth forest in Slovenia : are indirect human influences relevant?. *Plant Biosystems*, ISSN 1126-3504, 2010, vol. 144, no. 1, 194-201, ilustr. http://dx.doi.org/10.1080/11263500903560785, doi: 10.1080/11263500903560785. [COBISS.SI-ID 2550182]

KLOPČIČ, Matija, POLJANEC, Aleš, GARTNER, Andrej, BONČINA, Andrej. Factors related to nature disturbances in mountain Norway spruce (Picea abies) forests in the Julian Alps. *Écoscience*, ISSN 1195-6860, 2009, vol. 16, no. 1, str. [48]-57, ilustr. http://dx.doi.org/10.2980/16-1-3181, doi: 10.2980/16-1-3181. [COBISS.SI-ID 2371750]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Varstvo gozdov**
Course title:	**Forest Protection**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Upravljanje gozdnih ekosistemov**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Management of forest ecosystems**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**25**	**/**	**/**	**10**	**80**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Maja Jurc

Jeziki / Languages:	**Predavanja / Lectures:**	**slovenski / angleški Slovene / English**
	Vaje / Tutorial:	**slovenski / angleški Slovene / English**

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
1. Pogoji za vključitev v delo: - vpis v ustrezni letnik študijskega programa 2. Pogoji za opravljanje študijskih obveznosti: - opravljen seminar (pogoj)	1. Condition for inclusion in the work: - Inscription to adequate academic year 2. Condition for performing study obligations - Seminar

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

- Slušatelj pridobi in poveže znanja o škodljivih dejavnikih abiotskega (ujme, požari, suše, onesnaženi zrak ...) in biotskega (škodljivci, bolezni, parazitske cvetnice ...) izvora v gozdu s poškodbami, ki jih le-ti povzročajo ter ga uporabi v spoznavanju možnosti za preprečevanje in nadzorovanje škode. Za razumevanje kompleksnih vzrokov poškodb drevja v gozdu spozna: - škodljive fitofage: populacijsko dinamiko najpomembnejših herbivorov (predvsem žuželk) in sicer ključne dejavnike za njihov pojav v gozdu, dejavnike, ki regulirajo dinamiko njihovih populacij, mehanizme kontrole, epidemiologijo pomembnih gozdnih škodljivcev, njihove naravne sovražnike ter patogene. - bolezni: vpliv kompleksnih bolezni na propadanje gospodarsko najpomenbnejših gostiteljev (hrasti, bori, navadna smreka, navadna jelka in bukev). - vpliv klimatskih razmer na odnos patogen / herbivor / drevo. - invazivne tujrodne organizme: strategije in metode varstva pred škodljivimi invazivnimi vrstami v gozdovih Slovenije. - sledi področje načel in strategij integralnega varstva gozda, metod (tehnične, biotične, biotehniške) ter integriranih ukrepov varstva gozda. -pri biotičnih metodah je poudarek na novih znanjih o prehranjevalnih verigah in nekaterih živalskih skupinah (členonožci) in glivah v varstvu gozda. Simbioze in koevolucija. Razdelitve simbioz (komenzalizem, mutualizem, parazitizem); forezije in inkvilinizem. Paraziti živalskega izvora: ogorčice (Nematoda) in parazitoidi (Hymenoptera, Diptera). Pojem parazitizma v gozdarstvu (poškodbe in sušenje sestojev, razvoj biotičnih metod zatiranja škodljivih organizmov). Borova ogorčica (*Bursaphelenchus xylophilus*): mutualistična simbioza bora in hroščev. Forezije (glive, pršice) in pomen za lesne rastline na primeru ofiostomatoidnih gliv (Ascomycota: Ophiostomataceae). Razvoj raziskav gostitelj-parazit in učinkovitih strategij za biotične kontrole parazitov.	- Student will acquire and integrate knowledge about damaging abiotic factors in forests (weather damage, sleet, snow, fire, draught, pollution etc.) and biotic factors (pests, diseases, parasites) and injuries caused by these factors. Students will be capable of using their knowledge for supervising and controlling damage in forests. For understanding the complex causes of forest tree injuries, student will be introduced to: - Harmful phytophagous species; population dynamics of the most important herbivores, especially insects, key factors for their appearance in forest, factors regulating the dynamics of their populations, mechanisms of control, epidemiology of important forest pests, their natural enemies and their pathogens. - Diseases: influence of complex diseases to decline of economically important host (oak, pine, Norway spruce, silver fir, beech). - Influence of climatic conditions to the pathogen / herbivore / tree relationship. - Invasive alien organisms: strategies and methods of protection against harmful invasive species in the forests of Slovenia. - The next topic concerns principles and strategies of integral forest protection), methods (technical, biotical, biotechnical) and integrated forest protection measurements. -Considering biotical methods the emphasis is on new knowledge with regard to the importance of food chains and on some of the animal groups (arthropods) and fungi in forest protection. Symbiosis and coevolution. Classification of symbiosis (commensalism, mutualism, parasitism); phoresis and inquilinism. Animal parasitism: nematodes and parasitoids (Hymenoptera, Diptera). Importance of parasitism in the forest (injuries and death of stands, the development of biological methods for pest control). Pine wood nematode (*Bursaphelenchus xylophilus*): beetle-pine mutualistic symbiosis. Phoresis (fungi, mites) and their importance to the woody plants in the case of ophiostomatoid fungi (Ascomycota: Ophiostomataceae). Development of host-parasite relationship research and effective strategies for parasite control.

Temeljni literatura in viri / Readings:

AGRIOS, G. N., 1995. Plant Pathology.- Third Edition, Academic Press INC, 803 str., (izbrana poglavja).

LIEUTIER, F., DAY, R. K., BATTISTI, A., GRÉGOIRE, J-C. EVANS, F. H., 2004. Bark and Wood Boring Insects in Living Trees in Europe, a Synthesis.- Kluwer Academic Publishers, 569 str., (izbrana poglavja).

PARACER, S., AHMADJIAN, V., 2000. Symbiosis, An Introduction to Biological Associations. Second edition. Oxfprd University Press, Inc., 291 str., (izbrana poglavja).

SPEIGHT, R. M., WAINHOUSE, D., 1989. Ecology and Management of Forest Insects. Oxford University Press, 374 str., (izbrana poglavja.)

SMITH, I. M., McNAMARA, D. G., SCOTT, P. R., HOLDERNESS, M., BURGER, B., 1997. Quarantine Pests for Europe. Data sheets on quarantine pests for the Europe Union and for the European and Mediteranean Plant Protection Organization.- Second Edition. CAB International & European and Mediterranean Plant Protection Organization (EPPO), 1425 str., (izbrana poglavja).

Cilji in kompetence:

Razumevanje odnosov gostiteljska rastlina-parazit in razvoj učinkovitih strategij za kontrolo parazitov. Razumevanje pomena sobivanja številnih organizmov v gozdnih ekosistemih, pomen interakcij med njimi v okrnjenih ekosistemih - možnosti namnožitve, vrstna pestrost živalskih parazitov in patogenov in njihovi odnosi v antropogenih ekosistemih.

Objectives and competences:

Understanding of host plant-parasite relationship and development effective strategies for parasite control. Understanding of the importance of coexistence of a number of organisms in forest ecosystems, the importance of interaction between them in the truncated ecosystems - potentials of over-multiplication, species diversity of animal parasites and harmful pathogens and their relationships in anthropogenic ecosystems.

Predvideni študijski rezultati:

Znanje in razumevanje: Specifični škodljivi organizmi za drevesne vrste (predvsem živalski paraziti, njihove asociacijske glive in pršice, tujerodne unvazivne vrste), vpliv okolja na spremembe občutljivosti posameznih avtohtonih gostiteljev.
S sintezo tujih in lastnih spoznanj postanejo sposobni identificirati probleme in iskati rešitve (sodelovanje pri izdelavi sanacijskih načrtov). Pridobijo sposobnosti komuniciranja in argumentirane razlage absolviranih znanj v praksi.

Intended learning outcomes:

Knowledge and understanding: Specific harmful organisms for tree species (particularly animal parasites, their associatied fungi and mites, non-native invasive species), the impact of the environment to change the sensitivity of specific indigenous hosts.
With their own and other syntheses of knowledge, students will be capable of problem identification and finding solutions (taking part in the development of sanitation plans), with acquired skills of communication, and argument interpretation of knowledge to practice.

Metode poučevanja in učenja:

Learning and teaching methods:

Metode poučevanja in učenja: predavanja v kombinaciji s splošnimi razgovori / posvetovanji, seminar, vključitev v raziskovalno delo (laboratorijske vaje, delo na terenu).	Methods of teaching and learning: lectures in combination with general consultations, seminar, inclusion in research work (laboratory work, field work).

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni ali ustni izpit z ocenjevanjem posameznih vprašanj (1-5 točk). Študent lahko doseže 20 točk – pod 10 točkami je ocenjen negativno, nad 10 točkami je ocenjen pozitivno. Končna ocena je tehtana sredina izpita (80%) in seminarske naloge (20%).	80 20	Written or oral examination with scoring of individual questions (1-5 points). One can reach 20 points, under 10 points - the assessment is negative (1-5), over 10 points a positive assessment. Final evaluation of the course is weighted arithmetic mean of the assessment exam (80%) and assessment of seminar work (20%).

Reference nosilca / izvajalcev / Lecturer's references:

Prof. dr. Maja Jurc

REPE, Andreja, KIRISITS, Thomas, PIŠKUR, Barbara, DE GROOT, Maarten, KUMP, Bojka, JURC, Maja. Ophiostomatoid fungi associated with three spruce-infesting bark beetles in Slovenia. *Annals of forest science*, ISSN 1286-4560, 2013, vol. 70, iss. 7, str. 717-727, ilustr. http://dx.doi.org/10.1007/s13595-013-0311-y, doi: 10.1007/s13595-013-0311-y. [COBISS.SI-ID 3689638], [JCR, SNIP, WoS do 28. 10. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 28. 10. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A2 (Z1, A1/2); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 16.67, št. avtorjev: 6

MORAZA, María L., FERNÁNDEZ, Mercedes Fernández, JURC, Maja. Phoretic mites of the six-spined engraver beetle, *Ips sexdentatus* (Böerner, 1776) (Coleoptera, Scolytinae), on *Pinus halepensis* in Slovenia. *International journal of acarology*, ISSN 0164-7954, 2013, vol. < v tisku>, no. <v tisku>, str. <v tisku>. http://dx.doi.org/10.1080/01647954.2013.867900, doi: 10.1080/01647954.2013.867900. [COBISS.SI-ID 3748006], [JCR, SNIP, WoS do 3. 2. 2014: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A3 (Z1); uvrstitev: SCI, Scopus, MBP; tipologija ni verificirana
točke: 16.46, št. avtorjev: 3

JURC, Maja, BOJOVIC, Srdjan, FERNÁNDEZ, Mercedes Fernández, JURC, Dušan. The attraction of cerambycids and other xylophagous beetles, potential vectors of *Bursaphelenchus xylophilus*, to semio-chemicals in Slovenia. Phytoparasitica, ISSN 0334-2123, 2012, vol. 40, no. 4, str. 337-349, ilustr. http://dx.doi.org/10.1007/s12600-012-0234-4, doi: 10.1007/s12600-012-0234-4. [COBISS.SI-ID 3368358], [JCR, SNIP, WoS do 5. 2. 2014: št. citatov (TC): 2, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.25, normirano št. čistih citatov (NC): 1, Scopus do 29. 1. 2014: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0.25, normirano št. čistih citatov (NC): 1]

kategorija: 1A3 (Z1); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 15.8, št. avtorjev: 4

JURC, Maja. Lipin moljac miner (*Phyllonorycter Issikii*) u Sloveniji = The Lime leafminer (*Phyllonorycter Issikii*) in Slovenia. *Šumarski list*, ISSN 0373-1332, 2012, god. 136, br. 3/4, str. 119-127, ilustr. http://hrcak.srce.hr/file/120568. [COBISS.SI-ID 3356070], [JCR, SNIP, WoS do 5. 7. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 25. 7. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A4 (Z1); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 45.68, št. avtorjev: 1

JURC, Maja, ČERNÝ, Miloš, JURC, Dušan. Prvi nalaz stranog štetnika *Ophiomyia kwansonis* (Diptera: Agromyzidae) u Europi i njegovo fitosanitarno značenje = First record of alien pest *Ophiomyia kwansonis* (Diptera: Agromyzidae) in Europe and its phytosanitary significance. *Šumarski list*, ISSN 0373-1332, 2012, god. 136, br. 9/10, str. 501-507, ilustr. http://sumlist.sumari.hr/201209.pdf. [COBISS.SI-ID 3474854], [JCR, SNIP, WoS do 5. 2. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0, Scopus do 26. 11. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, čistih citatov na avtorja (CIAu): 0, normirano št. čistih citatov (NC): 0]
kategorija: 1A4 (Z1); uvrstitev: SCI, Scopus, MBP; tipologijo je verificiral OSICB
točke: 15.23, št. avtorjev: 3

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