

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	VPLIV OKOLJA NA ŽIVLJENJSKE PROCESE
<b>COURSE TITLE:</b>	ENVIRONMENTAL IMPACT ON LIFE PROCESSES

<b>Študijski program in stopnja</b> Study programme and level	<b>Študijska smer</b> Study field	<b>Letnik</b> Academic year	<b>Semester</b> Semester
Varstvo okolja in ekotehnologije, 1. stopnja	Modul: Okolje in zdravje	2. in 3.	/
Environmental Protection and Eco-technologies, 1 <sup>st</sup> level	Module: Environment and health	2 <sup>nd</sup> and 3 <sup>rd</sup>	/

**Vrsta predmeta / Course type** Modularni predmet / Modular subject

**Univerzitetna koda predmeta / University course code:** VOŽP

<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Sem. Vaje</b> Tutorial	<b>Lab. vaje</b> Laboratory work	<b>Teren. vaje</b> Field work	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
25	/	25	/	/	90	5

**Nosilec predmeta / Lecturer:** prof. dr. Andrej Čokl

**Jeziki / Languages:** **Predavanja / Lectures:** Slovenski / Slovenian  
**Vaje / Tutorial:** Slovenski / Slovenian

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

Osnovno znanje z področja biologije, pridobljeno v srednji šoli.  
Opravljen izpit iz predmeta »Ekosistemska biologija«.

**Prerequisites:**

Middle school gained basic knowledge on biology.  
Passed exam »Ecosystem biology«.

**Vsebina:**

**- Razumevanje posebnosti razmerja med okoljem in organizmi**

(zaznavanje problema, analitičen in/ali sintetičen pristop k njegovemu reševanju, sinteza in hierarhija rezultatov temeljnih in aplikativnih raziskav, teza, antiteza, izbira vprašanja in hipoteze kot osnove za uporabo primerne metode ter umestitev rezultatov v širši kontekst problema).

**- Osnovni mehanizmi življenjskih procesov**  
(homeostaza, povratne zveze, adaptacija in aklimatizacija).

**- Avtonomija organizma v odnosu do okolja**  
(osnovni procesi, ki zagotavljajo avtonomijo in sporazumevanje z okoljem na različnih nivojih od celice do organizma).

**- Prilagoditve osnovnih življenjskih procesov na dolgoročne vplive okolja**  
(dolgoročni vpliv okolja na mehanizme, ki zagotavljajo organizmu energijo, izmenjavo plinov, transport in osmoregulatorno ravnotežje).

**Content (Syllabus outline):**

**- Understanding of relation between environment and organisms**

(detection of a problem, analytical and/or synthetic approach to resolve it, synthesis and hierarchy of results obtained by basic and applied investigation, choice of the question and hypothesis as the basis for the use of the relevant method and for implementation of results into problem's broader context).

**- Basic mechanisms of life processes**  
(homeostasis, feed-back, adaptation and acclimatization).

**- Autonomy of organisms in relation to environment**

(basic processes that enable autonomy and communication with environment at different levels from cells to organism).

**- Adaptations of basic life processes to long-term impacts of environment**

(Long-term impact of environment on mechanisms that provide organism with energy,

- **Kontrolni mehanizmi, zaznavanje in odzivi organizmov na kratkotrajne vplive okolja** (komunikacija in stres, posebnosti in evolucija živčnega sistema, osnove sensorike in sinergija vhodov pri sprejemanju odločitev).

- **Vedenje kot osnova različnih metod biološke kontrole** (značilnosti vedenja in praktična uporaba znanja o mehanizmih komunikacije v različnih okoljih).

exchange of gases, transport and balance osmoregulatory conditions).

- **Control mechanisms, detection and reactions of organisms on environmental short-term impacts**

(Communication and stress, specificity and evolution of the neuronal system, basic knowledge on sensory system and synergy of inputs by accepting decisions).

- **Behaviour as the basis of different methods of biological control**

(Characteristics of behaviour and practical use of the knowledge on mechanisms running communication in different environments).

#### **Temeljni literatura in viri / Textbooks:**

1. Wilmer P., Stone G. and Johnston I. (2000) *Environmental physiology of animals*. Blackwell Science Ltd. ISBN 0-632-03517-X
2. Randall D., Burggren W. and French K. (2002). *Eckert Animal physiology: Mechanisms and adaptations* (5th Edition). Freeman, ISBN 0-7167-3863-S.
3. Bradbury, J.W. & Vehrencamp, S.L. (1998). *Principles of Animal communication*. Sinauer Associates, Inc., Sunderland, Massachusetts. ISBN 0-87893-100-7
4. Dusenberry D. B. (1992) *Sensory ecology: how organisms acquire and respond to information*. W.H.Freeman and Company New York. ISBN 0-7167-2333-6
5. Čokl A. and Borges M. (2017). *Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL)
6. Čokl A. Izvlečki predavanj predmeta »Vplivi okolja na življenjske procese«.

#### **Cilji in kompetence:**

##### **Predmetni specifični cilji in kompetence:**

Specifični cilji in kompetence so:

- seznaniti študente z temeljnimi zakonitostmi, ki zagotavljajo življenje vsakega organizma
- seznaniti študente z mehanizmi, prilagoditvami in evolucijo življenjskih procesov kot odgovor na dolgoročne in kratkoročne vplive okolja
- seznaniti študente z pomenom temeljnega znanja o življenjskih procesov pri razvoju in implementaciji alternativnih metod biološke kontrole.

##### **Splošni cilji in kompetence:**

Splošni cilji in kompetence so razviti:

- sposobnost poglobljenega razumevanja pomena varovanja okolja
- sposobnost analitičnega in sintetičnega pristopa k reševanju okoljevarstvenega problema z njegovim zaznavanjem in postavitvijo relevantnega vprašanja ter hipoteze kot osnove za uporabo primerne raziskovalne metode za njegovo rešitev.

#### **Objectives and competences:**

##### **Specific objectives and competences:**

Specific objectives and competences are to:

- provide students information on basic rules that enable life of each organism
- give students basic knowledge on mechanisms, adaptations and evolution of life processes as response to long- and short-term influences of environment.
- inform students with the importance of the background knowledge on life processes by development and implementation of different methods of biological control.

##### **General objectives and competences:**

General objectives and competences are to develop:

- the ability of profound understanding of the role of environmental protection
- the ability for analytical and synthetically approach to resolve a problem concerning environment by its detection, choice of the relevant question and hypothesis as the basis for the use of the relevant research method for its solution.

**Predvideni študijski rezultati:****Znanje in razumevanje:**

Študent bo ob zaključku predmeta sposoben:

- razumeti evolucijo in posebnosti razmerja med okoljem in organizmi
- poznati temeljne procese, ki zagotavljajo življenje vsakega organizma
- spoznati pomen avtonomije organizma v odnosu do okolja
- razumeti pomen dolgoročnih in kratkoročnih vplivov okolja na anatomijo in fiziologijo sistema življenjskih procesov organizma
- oceniti meje sposobnosti organizma za reakcijo ali prilagoditev na spremembe okolja.

**Prenesljive/ključne spretnosti in drugi atributi:**

Študent bo ob zaključku predmeta sposoben razviti:

- Sposobnost celovitega pristopa k razumevanju problema varovanja okolja
- sposobnost kritičnega zbiranja, sinteze in uporabe podatkov z različnih področij
- sposobnost samostojnega in/ali timskega pristopa k razumevanju določenega problema ter javne predstavitve dispozicije za njegovo reševanje
- sposobnost izbire relevantne metode biološke kontrole.

**Intended learning outcomes:****Intended learning outcomes:**

The student will be at the end of this course able to understand:

- evolution and specificity of relation between environment and organism
- basic processes that ensure life of each organism
- importance of organism autonomy in relation to its environment
- importance of long- and short-term influences of environment on anatomy and physiology of the organism's system of life processes
- limits of organism's capabilities to react and/or adapt to changes in its environment.

**Transferable/Key skills and other attributes:**

The student will be at the end of this course able to develop:

- holistic approach to understand problems of environmental protection
- critical acquisition, synthesis and use of data on different areas
- individual and/or team approach to understand a specific problem and capability to represent disposition of its solution
- capability to choose relevant methods of biological control.

**Metode poučevanja in učenja:****Oblike dela:**

- predavanja
- samostojno delo študentov/tk.

**Metode dela:**

- razlaga
- dialog in diskusija
- sprotno preverjanje sprejetega znanja v obliki testov
- samostojno in skupinsko delo pri pripravi seminarskih nalog ter dispozicij hipotetičnih raziskovalnih projektov.

**Learning and teaching methods:****Forms of teaching:**

- In-class lectures
- individual work of students

**Teaching methods:**

- explanation
- dialog and discussion
- real-time control of gained knowledge by tests
- individual and team work by preparation of seminars and dispositions of hypothetic research projects.

<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Weight (in %)</b>	<b>Assessment:</b>
- pisni izpit	<b>70</b>	- written exam
- priprava, predstavitev in zagovor seminarske naloge	<b>20</b>	- preparation, presentation and defence of a seminar paper
- priprava, predstavitev in zagovor dispozicije hipotetičnega projekta	<b>10</b>	- preparation, presentation and defence of a disposition of an hypothetical project
Študenti imajo možnost prostovoljno pridobiti do 4 % bonus točk z reševanjem štirih testov v času trajanja izvajanja predmeta. Bonus odstotki se prištejejo k skupni oceni pisnega izpita, zagovora seminarske naloge in predstavitve dispozicije raziskovalnega projekta.		Students have the possibility to acquire voluntary bonus of up to 4 % by solving four tests during running of the course. Bonus is added to the percentage obtained by the written exam, preparation, representation and defence of a seminar paper and disposition of an hypothetical project.
Ocenjevalna lestvica :		Grading system:
- zadostno 6: 60 – 67 %		- sufficient (D) ( 6): 60 – 67 %
- dobro 7 68 – 75 %		- good (C) ( 7): 68 – 75 %
- prav dobro 8 76 – 83 %		- very good (B) ( 8): 76 – 83 %
- prav dobro 9 84 – 90 %		- very good (B+) ( 9): 84 – 90 %
- odlično 10 91 – 100 %		- excellent (A) (10): 91 – 100 %

**Materialni pogoji za izvedbo predmeta :**

Predavalnica z multimedijско opremo

**Material conditions for subject realization:**

Classroom with the multimedia equipment

**Obveznosti študentov:**

- 80 % udeležba na predavanjih  
- pisni izpit, priprava, predstavitev in obramba seminarske naloge ter dispozicije raziskovalnega projekta.

**Student's commitments:**

- 80 % mandatory participation at lectures  
- written examination, preparation, presentation and defence of a disposition of a seminar paper and of an hypothetical project.

**Reference nosilca predmeta:**

**Odgovorni nosilec projekta:**  
**Mednarodni projekti**  
- Pentatomidae communication and its implication to soybean management. (ARRS, BI-BR/2010-2012-003, 2010-2012).  
- Pentatomidae communication and its implication to soybean management. Phase II: Application in the field. (ARRS, BI-BR/2012-2014-002, 2012-2014).  
- Monitoring of beetles of the family Cerambycidae in Slovenia by the use of sex specific and aggregation pheromones in combination with plant volatiles with special interest on potential pest and protected species". (ARRS, BI-US/12-13-018, 2012-2013).  
- Determination of intraspecific sound communication ways of Green Shield Bug (*Palomena prasina* L. Heteroptera: Pentatomidae). (ARRS, BI-TR/2011-2013-005, 2011-2013).  
- BICO POLL: Targeted precision biocontrol and pollination enhancement in organic cropping systems. ERA-NET CORE Organic 2 project (coordinator for Slovenia, coordinator of the WP8) (2011-2014).

**Lecturer's references:**

**Research Activity (2010-2018):**  
**Project responsible coordinator:**  
**International projects**  
- Pentatomidae communication and its implication to soybean management. (ARRS, BI-BR/2010-2012-003, 2010-2012).  
- Pentatomidae communication and its implication to soybean management. Phase II: Application in the field". (ARRS, BI-BR/2012-2014-002, 2012-2014).  
- Monitoring of beetles of the family Cerambycidae in Slovenia by the use of sex specific and aggregation pheromones in combination with plant volatiles with special interest on potential pest and protected species. (ARRS, BI-US/12-13-018, 2012-2013).  
- Determination of intraspecific sound communication ways of Green Shield Bug (*Palomena prasina* L. Heteroptera: Pentatomidae). (ARRS, BI-TR/2011-2013-005, 2011-2013).  
- BICO POLL: Targeted precision biocontrol and pollination enhancement in organic cropping systems. ERA-NET CORE Organic 2 project (coordinator for Slovenia, coordinator of the WP8) (2011-2014).

- Q-DETECT: Developing quarantine pest detection methods for use by national plant protection organisations (NPPO) and inspection services (7<sup>th</sup> Framework EU project no. 245047, Theme KBBE-2008-1-4-01) (coordinator of the WP6) (2009-2013).

#### **Domači projekti**

- *Picromerus bidens-Nezara viridula*: model study of the predator-prey relation as the basis for biological control of invasive insects in Slovenia. (ARRS, J1-2133, 2009-2012).

- The vibration sensory system of the cave cricket *Troglophilus neglectus* (Rhaphidophoridae): from signals to neuronal networks. (ARRS, J1-0823) (2008-2011).

#### **Pedagoška in mentorska aktivnost:**

- "Ekofiziologija", dodiplomski študij, Fakulteta za znanosti o okolju, Univerza v Novi Gorici, Nova Gorica, Slovenija.

- "Komunikacija živali", doktorski študij, Fakulteta za naravoslovje in matematiko, Univerza v Mariboru, Maribor, Slovenija.

- "Komunikacija živali", doktorski študij, Biotehniška fakulteta, Univerza v Ljubljani, Ljubljana, Slovenija.

- "Vpliv okolja nas življenjske procese", dodiplomski študij, Visoka šola za varstvo okolja, Velenje, Slovenija.

- V obdobju 2003-2013 je bil mentor 12 doktorandom.

- Q-DETECT: Developing quarantine pest detection methods for use by national plant protection organisations (NPPO) and inspection services (7<sup>th</sup> Framework EU project no. 245047, Theme KBBE-2008-1-4-01) (coordinator of the WP6) (2009-2013).

#### **National projects**

- *Picromerus bidens-Nezara viridula*: model study of the predator-prey relation as the basis for biological control of invasive insects in Slovenia. (ARRS, J1-2133, 2009-2012).

- The vibration sensory system of the cave cricket *Troglophilus neglectus* (Rhaphidophoridae): from signals to neuronal networks. (ARRS, J1-0823) (2008-2011).

#### **Teaching and Tutoring Activities:**

- "Ecophysiology", Graduate Level, Faculty of Environmental Sciences, University of Nova Gorica, Nova Gorica, Slovenia.

- "Animal Communication", PhD studies, Faculty for Natural Sciences and Mathematics, University of Maribor, Maribor Slovenia.

- "Animal Communication", PhD studies, Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia.

- "The Influence of Environment on Life Processes", Graduate Level, High School for Environmental Protection, Velenje, Slovenia.

- Supervisor of 12 PhD students in the period 2003-2013.

#### **Izbrane znanstvene publikacije / Selected scientific publications:**

##### **Scientific monographies**

ČOKL A. Borges M. (2017). *Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 0-256.

##### **Chapters in scientific monographies**

(1) ČOKL A., Zorovič M., Žunič-Kosi A., Stritih Peljhan N., Virant-Doberlet M. (2014). Communication through plants in a narrow frequency window. In: Cocroft R.G. et al. (editors). *Studying vibrational communication*, Animal signals and communication, vol. 3. Springer, Berlin Heidelberg, pp. 171-195.

(2) Stritih Peljhan N., ČOKL, Andrej (2014). The role of frequency in vibrational communication of Orthoptera. In: Cocroft R.G. et al. (editors). *Studying vibrational communication*, Animal signals and communication, vol. 3. Springer, Berlin Heidelberg, pp. 375-393.

(3) Virant-Doberlet M., Mazzoni V., De Groot M., Polajnar J., Lucchi A., Symondson W.O.C., ČOKL A. (2004). Vibrational communication networks : eavesdropping and biotic noise. In: Cocroft R.G. et al. (editors). *Studying vibrational communication*, Animal signals and communication, vol. 3. Springer, Berlin Heidelberg, pp. 93-123.

(4) Čokl A., Blassioli Moraes M.C., Laumann R.A., Borges M. (2017). Communication as the basis for biorational control. In: Čokl A., Borges M. (editors).

*Stink bugs: biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 78-94.

(5) Borges M., ČOKL A. (2017). Introduction. In: Čokl A., Borges M. (editors). *Stink bugs: biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. XV-XX.

(6) Žunič Kosi A., ČOKL A. (2017). Predatory stink bugs (Asopinae) and the role of substrate-borne vibrational signals in intra- and interspecific interactions. . In: Čokl A., Borges M. (editors).

*Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 59-77.

(7) ČOKL A., Žunič A., Virant-Doberlet M. (2017). Stink bug communication network and environment. In: Čokl A., Borges M. (editors). *Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 165-179.

(8) ČOKL A., Laumann R.A., Stritih Peljhan N. (2017). In: Čokl A., Borges M. (editors).

*Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 125-164.

(9) Borges M., Blassioli Moraes M.C., Laumann R.A., ČOKL A. (2017). Suggestions for neotropical stink bug pest status and control. In: Čokl A., Borges M. (editors). *Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 246-253.

(10) Laumann R.A., Maccagnan D.H.B., ČOKL A. (2017). Use of vibratory signals for stink bug monitoring and control. In: Čokl A., Borges M. (editors). *Stink bugs : biorational control based on communication processes*. CRC Press, Taylor&Francis Group, Boca Raton (FL), pp. 226-245.

#### **Original scientific articles**

(1) Kocsor S., ČOKL A. (2014). Percussion signals of *Lygus rugulipennis* Poppius (Heteroptera: Miridae). *Central European journal of biology*, 9 (5): 543-549.

(2) Zgonik V., ČOKL A. (2014) The role of signals of different modalities in initiating vibratory communication in *Nezara viridula*. *Central European journal of biology*, 9 (2): 200-211.

(3) Blassioli Moraes M.C., Magalhaes D.M., ČOKL A., Laumann R.A., Da Silva J.P., Silva C.C.A., Borges M. (2014). Vibrational communication and mating behaviour of *Dichelops melacanthus* (Hemiptera: Pentatomidae) recorded from loudspeaker membranes and plants. *Physiological entomology*, 39 (1): 1-11.

(4) ČOKL A., Laumann R.A., Žunič A., Blassioli Moraes M.C., Virant-Doberlet M., Borges M. (2015). Interference of overlapping insect vibratory communication signals: an *Euschistus heros* model. *PloS one*, 10 (6): 1-16.

(5) Zorović M., ČOKL A. (2015). Laser vibrometry as a diagnostic tool for detecting wood-boring beetle larvae. *Journal of pest science*, 88 (1): 107-112.

(6) Laumann R.A., ČOKL A., Blassioli Moraes M.C., Borges M. (2016). Vibratory communication and its relevance to reproductive isolation in two sympatric stink bug species (Hemiptera: Pentatomidae: Pentatominae). *Journal of insect behavior*, (29) (6): 643-665.

(7) Laumann R.A., ČOKL A., Blassioli Moraes M.C., Borges M. (2016). Vibratory communication and its relevance to reproductive isolation in two sympatric stink bug species (Hemiptera: Pentatomidae: Pentatominae). *Journal of insect behavior*, (29) (6): 643-665.

(8) ČOKL A., Dias A.M., Blassioli Moraes M.C., Borges M., Laumann R.A. (2017). Rivalry between stink bug females in a vibrational communication network. *Journal of insect behavior*, 30 (6): 741-758.

(9) Laumann R.A., Maccagnan D.H.B., ČOKL A., Blassioli Moraes M.C., Borges M. (2018). Substrate-borne vibrations disrupt the mating behaviors of the neotropical brown stink bug, *Euschistus heros*: implications for pest management. *Journal of pest science*, [in press].