

COURSE DESCRIPTION

Course code	Volume in ECTS credits	Institution	Faculty	Department
AGR8022	7	VDU-ŽŪA	Faculty of Agronomy	Institute of Biology and Biotechnology

Course title in Lithuanian

Bestuburių zoologija

Course title in English

Invertebrate zoology

Study methods	Volume in ECTS credits
Lectures	2
Consultations	1
Seminars	1
Individual work	3

Short course annotation in Lithuanian (up to 500 characters)

Bestuburių zoologijos kursas supažindina su bestuburių gyvūnų įvairove ir sistematika. Studijų metu analizuojami įvairūs vienaląsčiai organizmai, jų išorinė ir vidinė kūno sandara bei ekologija ir įvairovė. Tai pat ir daugialąsčiai bestuburiai gyvūnai, jų anatomija, morfologija ir ekologija. Nagrinėjama įvairių bestuburių grupių charakteristika, apžvelgiant pagrindinius biologinius aspektus: mitybą, elgsenos ypatumus, dauginimosi ir gyvenimo ciklus, pasiskirstymą ir adaptacijas tam tikrai aplinkai. Studijų metu apžvelgiama kiekvienos bestuburių grupės rūšinė įvairovė, ekonomiškai, mediciniškai ir ekologiškai svarbias bestuburių gyvūnų rūšys. Apžvelgiama bestuburių svarba vertinant aplinkos būklę. Aptariamos retosios ir nykstančios bestuburių rūšys, analizuojami faktoriai, nulemiantys šių rūšių išsaugojimą.

Short course annotation in English (up to 500 characters)

This course is designed to provide students with a basic understanding of biology, morphology, anatomy and physiology of the more common invertebrate phyla. This course is intended to introduce students with knowledge on structure, functional processes and diversity of protozoa and metazoa invertebrates. The characteristics (principles of feeding, behavior, reproduction, adaptations to various environments) of the main groups of invertebrates will be analyzed. The taxonomy, distribution, diversity and economical, medical and ecological importance of invertebrates will be presented. The rare species of invertebrates and factors important for the conservation invertebrate species will be observed.

Relevance of the course

Invertebrate Zoology is one of the most important natural science study subjects analysing the structure, biology, diversity and systematic structure of invertebrate animals and their relationship with other components of living and non-living nature. Invertebrates constitute for about 95 percent of the total number of species and individuals of wildlife of the Earth. They are common in all biocenoses and occupy a very important place in nature and human life. A variety of invertebrate animals ranging from unicellulars to molluscs and echinoderms are examined in the course. Students consistently examining systematic groups of invertebrate animals, understand the main directions of the evolutionary process and the structural and functional adaptations that have emerged during this process. While studying this subject, students will know the systematics of unicellular and multicellular invertebrates, the representatives of main types, their morphology, bioecology, the principles of their monitoring and protection, and forms of relationships between living organisms. Understanding of nature conservation problems and the necessity of

biodiversity preservation will be indoctrinated. Ability to identify and characterize the main invertebrate animals, explain their biology peculiarities, performance of accounting, responsibility in making necessary decisions regarding the environmental factors and environmental protection requirements will be elevated.

Course aims

Preparation of theoretically qualified, capable of critical and creative thinking, broad-based students with knowledge and skills in the fields of biology, ecology, agronomy, and the environment, and capable in adapting this knowledge and skills in their professional activity under the altering environment conditions. To construct the system of theoretical knowledge of living and non-living nature and cognition of ecosystems, to improve abilities of application of mathematical methods and information technologies, to develop skills in assessment and application of protection measures of individual components of nature. To provide students with knowledge of evolution, systematics, morphology, their interrelations, significance, ecology of invertebrate animals; to study in detail the invertebrates living in Lithuania (protozoa, worms, arthropods, molluscs), their phylogeny, behavior, structure, ecology, methods of protection and control.

Content (topics) and methods

Content of the subject:

Lectures:

1. History of Zoology, taxonomy. Overview of living organisms. Animal Kingdom. Location and significance of invertebrates in ecosystems.
2. Structure, systematics of unicellular animals. The most important representatives, their ecology, significance.
3. Types of Sarcodina, Flagellata, Sporozoa, Cnidosporidia, Microsporidia, Ciliophora (structure, systematics, ecology, phylogeny).
4. Subkingdom of Multicellulars (structure, development, taxonomy).
5. Subsections of Phagocytelozoa, Parazoa (types of Placozoa, Spongia), key representatives, ecology, significance.
6. Eumetazoa (types of Coelenterata and Ctenophora), key representatives, ecology, significance.
7. Section of Bilateria. Types of Plathelminthes, Nemathelminthes, and Annelida worms. Systematics, ecology, and significance.
8. The main representatives of the types of Nemertini, Rotatoria, Cephalorhyncha, Acanthocephala, Echiurida, Sipunculida. Their significance and ecology.
9. Types of Onychophora, Tardigrada, Tentaculata, Branchiopoda, Hemichordata, Pogonophora, Chaetognatha, Echinodermata. Their classification, morphology, ecology.
10. Type of Mollusca. Systematics, ecology, and significance.
11. Type of Arthropoda. Subtypes of Chelicerata, Trilobitomorpha, Pantopoda. Their systematics and ecology.
12. Class of Arachnida. Their systematics, ecology, and significance.
13. Subtype of Branchiata. Class of Crustacea. Systematics, ecology, and significance.
14. Subtype of Tracheata. Class of Myriapoda. Systematics, ecology, and significance.
15. Class of Insecta (morphology, behavior, reproduction and development, ecology).
16. Systematics and significance of insects.
17. Research methods, monitoring, and bioindication of invertebrate animals.
18. Control and protection problems of invertebrate animals.

Seminars:

1. Systematics and protection of unicellular animals.
2. Spongia, Coelenterata and their protection.
3. Worms.
4. Arthropoda. Subtype of Chelicerata.
5. Subtype of Branchiata.
6. Insect structure, larvae, pupae.

7. Insect systematics.
8. Mollusca, Echinodermata.
9. Coral reef protection.

Traditional and innovative study methods are used to convey the subject content. Traditional study methods are represented by a classical lecture (examination of various topics). Material of the lecture is visualized using multimedia equipment, video equipment. During the sessions, part of the time is devoted to students' speeches and discussions. Practical tasks include assignments using animal samples, their preparations or pictures. Students perform tasks independently using exercise descriptions, identification keys, collections, and in consultation with the teacher. During the practical work each student has the opportunity to use the microscope individually. A video camera connected to a microscope and computer equipment is used for demonstration of particular work stages.

Presentation (defence) of practical work results is mandatory.

Structure of cumulative score and value of its constituent parts

The 10-point cumulative assessment structure is applied, following the criteria for assessing the subject's learning outcomes. The quality of laboratory work is evaluated according to the quality of individual work as well as the quality of the answers to the questions and the ability to discuss. During the control work, students respond to test questions by selecting one of the 3 answers given, recognizing 10 samples of animals or their paintings, indicating their taxonomy. The quality of practical work is assessed by the quality of individual work as well as the quality of the answers to the questions and the ability to discuss. During the exam, problematic questions requiring short answers are presented. Exam is the final assessment of the student's knowledge, and only those who have assessments of their independent work have the right to attend it.

Compulsory reference materials

No.	Authors of publication, title, publishing house, year of publication.
1.	Kazlauskas R. Bestuburių zoologija. Vilnius, 1988, 384 p.
2.	Žiogas A. Bestuburių zoologija ir apsauga. Mokomoji knyga. Akademija, 2009. 95 p.
3.	Edward E. Ruppert. Invertebrate Zoology: A Functional Evolutionary Approach Sinauer Associates, 2009.
4.	Hill R.W., Wyse G.A., Anderson M. Animal Physiology Sinauer Associates, 2004.
5.	Ruppert E.E., Barnes R.D. Invertebrate zoology. Sixth edition. Saunders College Publishing 1991. 112 p.
6.	Brusca R. C., Brusca G. J. Invertebrates. Sinauer Associates, 2003.
7.	Mažiulis D., Starodubaitė M. Zoologija.- Vilnius; Siveida, 2001. 296 p.
8.	Догель В. А. Зоология беспозвоночных М. 1981.
9.	Thorpe J. H., Covich A.P. Ecology and Classification of North American Freshwater Invertebrates, (Aquatic Ecology) The McDonald and Woodward Publishing Company Blacksburg, Virginia, 2002.
10.	Invertebrate zoology (CD-ROM). Mac/Win CD-ROM/2001/ 27AW2288
11.	Kingdom Animalia: The invertebrates. /DVD/ 2005/27AW2789
12.	Kingdom Animalia: The invertebrates. /DVD/ 2005/27AW2789

Supplementary reference materials

No.	Authors of publication, title, publishing house, year of publication.
1.	Gecevičiūtė S., Bestuburių zoologijos laboratorinių darbų atlikimas. Vilnius, 1994.
2.	Invertebrate zoology. Peer-reviewed journal. KMK Scientific Press Ltd. Moscow. Volume 1 – 9, 2010, 2011, 2012.
	Kublickienė O. Parazitiniai pirmuonys. Mokomoji knyga aukštųjų mokyklų studentams.

3.	Vilniaus universiteto leidykla. 2000. 86 p.
4.	Lešinskas. A., Pileckis S. Vadovas lietuvis vabzdžiams pažinti. – V: Mintis, 1967.- 372 p.
5.	A. Žiogas.,D.Zakarauskaitė. Dirvožemio biologija. Mokomoji knyga. 2010. 136 p/
6.	A. Žiogas. Agriocenozių bioindikacija ir apsauga/ Mokomoji knyga, 2012, 191 p.
7.	Rašomavičius V., editor. Red data book of Lithuania (Lietuvos Raudonoji knyga). Kaunas: Lututė, 2007. 800 p. (in Lithuanian).
8.	Helsdingen van P.J Background information on invertebrates of the Habitats Directive and the Bern Convention. Strasbourg : Council of Europe Publishing, 1996.
9.	Haslett ,J. R. European strategy for the conservation of invertebrates : Convention on the Conservation of European Wildlife and Habitats (Bern Convention). Strasbourg : Council of Europe Publishing, 2007.
10.	Raudonikis L. Europos Sąjungos Buveinių direktyvos saugomos rūšys :vadovas Lututė, 2006.
11.	Lynn D. H. The ciliated protozoa. Springer, 2007.
12.	Šatkauskienė I. Gėlųjų vandenų bestuburiai. VDU leidykla, 2004.
13.	Жизнь животных. В 7 т. Том первый. Простейшие – щупальцевые. Москва. Просвещение,1987. – 448 с.
14.	Жизнь животных. В 7 т. Том второй. Молюски – ракообразные. Москва. Просвещение,
15.	1988. – 447 с.
16.	Жизнь животных. В 7 т. Том третий. Членистоногие – онихофоры. Москва. Просвещение, 1984. – 463 с.

Supplementary reference materials

Course programme designed by

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