BIOLOGY OF ANIMAL SYSTEMS

ECTS: 10

Course coordinator: Prof. Dr. Boris Bulog

Lecturers: Prof. Dr. Boris Bulog, Prof. Dr. Tine Valentinčič, Assist. Prof. Dr. Janko Božič, Prof. Dr. Jasna Štrus, Prof. Dr. Kazimir Drašlar, Assist. Prof. Dr. Gregor Zupančič, Prof. Dr. Andrej Čokl, Assist. Prof. Dr. Primož Zidar, and invited lecturers

No. of hours: 250
Lectures: 20
Seminar: 20
Lab. work: 20
Other: 190

2. Entry requirements: 
Completed university or 2nd level Bologna studies from the wider field of natural history, mathematics and computer studies or the narrower field of life sciences (Klasius classification).

3. Objectives of the course and intended learning outcomes: (competences)

Educational objectives
To acquaint students with specific structures and functions of animals at the levels of cells, tissues, organs and the entire organisms. To introduce students to the characteristics of the body plan and function of the invertebrate and vertebrate groups being used in the laboratories of the lecturers in the module. In-depth specific knowledge of neural systems function. Getting acquainted with learning mechanisms in invertebrates, especially molluscs, crustaceans, and insects, as well as learning in fish, mammals and humans.

Intended learning outcomes
At the end of the PhD study, doctors of biological sciences (the course on the biology of animal systems) will be able to use the methods for studying structure and function in certain species of invertebrates and vertebrates, to interpret ultrastructure at the functional level and to conduct neuro-ethological, comparative-psychological and physiological research into neural mechanisms of perception and motorics.

4. Syllabus outline:

a) Functional-morphological adaptations of sensory and some other organs to specific environmental conditions in lower vertebrates. Biological rhythms and the pineal organ in lower vertebrates. The pigment system of lower vertebrates.

b) The developmental biology of amphibians from gametogenesis to mechanisms of metamorphosis, with adaptations to specific environmental conditions. Estimating the age of vertebrates with modern methods and their practical application.

c) Structural, functional and behavioural adaptations of terrestrial arthropods; the characteristics of the structure of the integument, the digestive and the transport system. Ecdysis and embryonic development – model processes for the study of secretion and bio-mineralization of the crustacean cuticle.

d) The communication of bees, the behaviour of bees inside the beehive as well as in
the pasture – an example of the analysis of the social live of animals. The involvement of neuromodulators, hormones and the carbohydrate metabolism in the control of behaviour (the example of bees).

e) Taste and smell: Sensory receptor molecules can either be ion channels or they can be separate from them, so that a mediating mechanism transfers the excitation from the receptor to the channel. Taste triggers reflex actions in some fish, while in other fish and land vertebrates, the consciousness controls the responses to taste stimuli. The 2004 Nobel Prize was awarded to Linda Buck and Richard Axel for research into olfaction. Their research made the connection between genes for the olfactory receptor proteins, olfactory transduction and the chemotopic representations of smells in the brain. Nowadays, the entire olfactory pathway is known, from the passage of the smell through the mucus, the binding to the receptor protein, transduction to non-selective ion channels, the receptor and action potentials on the receptor cells and excitation of specific glomeruli in the olfactory bulbus. The senses present smells to the brain as genetically determined patterns of glomerular activity.

f) The neurobiology and functional morphology of the sensory receptors. The transduction, transformation and processing of sensory information. The energetics and energy cost of the sensory processes. The basics of animal communication, with a stress on mechanical signals. The information content of signals and their analysis at various levels of the sensory part of the central nervous system.

g) Computer-assisted video analysis of animal behaviour: acquisition, processing and interpretation.

5. Literature (in the case of books and monographs, study sources are only selected chapters from them):

Prof. Dr. Boris Bulog
Selected chapters from following books:

Prof. Dr. Tine Valentinčič
The laboratory’s collection of research papers on taste and smell research contains approximately 17000 items. A selection of 3-10 papers is made by the teacher and the student.

Assist. Prof. Dr. Janko Božič
Selected chapters from following books:
- Hoy, Marjorie A. (2003) Insect molecular genetics : an introduction to principles and

Prof. Dr. Jasna Štrus, Assist. Prof. Dr. Primož Zidar, Assist. Prof. Dr. Rok Kostajnšek
- Prof. Dr. Kazimir Drašlar, Assist. Prof. Dr. Gregor Zupančič
- Selected chapters from the following books:
  - Squire LR., Bloom, McDonell, Roberts, Spitzer, ZIGMOND FUNDAMENTAL NEUROSCIENCE Academic Press

Prof. Dr. Andrej Čokl
Selected chapters from following books:

6. Teaching methods
Lectures, consultations, seminars; lab work, project work.

7. Assessment methods
Oral or written examination as well as a seminar or a project assignment.

8. References:

Bulog Boris


Štrus Jasna


Zidar Primož


Valentinčič Tine


Božič Janko


Drašlar Kazimir

2. DROBNE, Damjana, MILANI, Marziale, BALLERINI, Monica, ZRIMEC, Alexis, BERDEN ZRIMEC, Maja, TATTI, Francesco, DRAŠLAR, Kazimir. Focused ion beam for microscopy and in situ sample preparation : application on a crustacean digestive system. J. biomed. opt., 2004, letn. 9, št. 6, p. 1238-1243. [COBISS.SI-ID 1484367]


Zupančič Gregor


Čokl Andrej

