SYLLABUS

Name: _**Molecular techniques (25-BI-S2-E1-MT-AN)**_
Name in Polish: __Techniki molekularne__
Name in English: _**Molecular techniques**_

Information on course:

Course offered by department: Faculty of Biological Sciences
Course for department: Faculty of Biological Sciences

Default type of course examination report:
Grading
Language:
English
Short description:
Prerequisites regarding knowledge, skills, and social competences for the course/module Basic knowledge in animal genetics and cell biology. Student's own work: - preparing for classes: 15h - samples handling: 20h - reading scientific publications: 12h - preparing for tests: 15
Description:
Educational aims: The aim of this course is to equip students with the skills to analyse the data using chosen statistical methods, data visualisation on plots and maps in the R environment. Course content: - introduction to R and Rstudio; - data types, R data structures, importing data; - basic data wrangling (with dplyr); - categorical data analysis; - comparing groups (Wilcoxon's signed rank test, Kruskal-Wallis test, t-Student test); - correlations; - linear regression; - creating plots: histograms, bar charts, box-plots, scatterplots, line-graphs; - creating maps; - online resources to learn R. Principles of molecular techniques used in animal biodiversity assessment. Applying the molecular techniques, using appropriate theoretical background and practical lab skills, to design research, to address biological problems and questions. Lectures: - Chemical basis of genetic information; - Molecular tools for molecular ecologists; - Next generation sequencing in ecology; - CRISPR method in medical and biological sciences; - Protein sequence, structure and epitopes, protein databases. Protein detection using immunological and biochemical methods; - Basics of cytogenetics, methods of obtaining and staining chromosome preparations. Cytogenetic analysis of the level of ploidy and the course of meiosis as a tool for learning about changes in the reproductive system and ways of inheritance in hybridogenetic animals. Laboratories (in one block, molecular lab and computer lab): - Quantitative and qualitative assessment of genetic material based on DNA extracted for host-pathogen models. - PCR-based taxa identification and barcoding. - Detection and quality of PCR products. - Electrophoresis in agarose gel. - Extraction and purification of targeted PCR products from agarose gel, preparation of PCR products for sequencing. - Sequence analysis and primer design using bioinformatic tools. - Parasite strains identification based on sequence analysis. - Analysis of protein expression in animal tissues using immunohistochemistry and immunofluorescence microscopy. - Preparation of chromosomal spreads from animal samples, basic chromosome staining techniques, karyological analysis.
Bibliography:
Mandatory and recommended reading list: Selected chapters from the following books: Rowe G., Sweet M., Beebee T.J.C. "An Introduction to Molecular Ecology" 2017. 3rd Ed. Oxford University Press; Alberts et al. "Molecular biology of the cell", 4-7th Ed. Garland Science; Fletcher H., Hickey I. "BIOS Instant Notes in Genetics". 2012. 4th Ed. Garland Science; Selected articles chosen by teachers
Learning outcomes:
Intended learning outcomes Student: K_W03 - characterizes basic and modern techniques and tools used in molecular and cytogenetic lab; K_U04

- can independently perform molecular and cytogenetic techniques in the laboratory and analyse DNA sequences;

K_K04
- follows ethics in laboratory environment and lab safety rules.

K_U13
- uses terminology and vocabulary necessary to explain and describe biological processes.

Assessment methods and assessment criteria:

Assessment methods for the intended learning outcomes:
- Lectures: written test, the minimum amount of points 51%;
- Lab: control of attendance, constant cooperation with the teacher and control of the correctness of tasks and safety during the tasks performed, writing summary reports.

Credit requirements for individual components of the course/module:
- Lectures: written test.
- Lab: continuous control of attendance and progress in the subject of classes, written test

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	4	2023/24-Z	