SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Biostatistical methods in management of genetic resources

Educational subject description sheet

Basic information

Field of study Biotechnology	**Didactic cycle** 2024/25
Speciality -	**Subject code** BBTBTjS_D.320K.01630.24
Organizational unit Faculty of Biology and Biotechnology	**Lecture languages** english
Study level first cycle (engineering degree)	**Mandatory** Elective subjects
Study form full-time studies	**Block** Major subjects
Education profile General academic	**Disciplines** Biological sciences

Coordinator	Hanna Bolibok-Brągoszewska
Teacher	Hanna Bolibok-Brągoszewska

Period	**Examination**	**Number of ECTS points**
Semester 6	Pass with grade **Activities and hours** Lecture: 15 Laboratory exercises: 15	2

Goals

Code	Goal
C1	1.To familiarize the student with high-throughput methods of DNA analysis and biostatistical methods useful in managing gene bank resources supported by DNA genotyping 2. Preparing the graduate for independent work in the field of broadly understood protection of genetic resources and molecular ecology

Entry requirements

Genetics, Genetic Engineering;
The student has knowledge and basic skills in the field of general and molecular genetics and the basics of genetic engineering, in particular, the most important molecular techniques for detecting DNA polymorphisms and basic bioinformatics tools.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the methods and procedures used in the characterization of genetic resources	BTj_K3_W01_inz, BTj_K3_W04, BTj_K3_W07_inz, BTj_K3_W09, BTj_K3_W12	Written credit
W2	the status quo of DNA marker-assisted management of genetic resources in the world	BTj_K3_W01_inz, BTj_K3_W04, BTj_K3_W07_inz, BTj_K3_W09, BTj_K3_W12	Written credit
Skills – Student can:			
U1	apply and properly evaluate the effectiveness of biostatistical methods to analysis of data from characterization of genetic resources	BTj_K3_U04_inz, BTj_K3_U22	Presentation, Test (written or computer based), Assessment of activity during classes
U2	use computer programs designed to analyze the genetic structure of a population	BTj_K3_U04_inz, BTj_K3_U22	Presentation, Test (written or computer based), Assessment of activity during classes
U3	develop and apply in practice his skills in the field of characterizing genetic resources using biostatistical methods	BTj_K3_U04_inz, BTj_K3_U22	Presentation, Test (written or computer based), Assessment of activity during classes
Social competences – Student is ready to:			
K1	develop practical skills in characterizing genetic resources with biostatistical methods	BTj_K3_K01, BTj_K3_K02	Presentation, Assessment of activity during classes

Study content

No.	Course content	Subject's learning outcomes	Activities

No.	Course content	Subject's learning outcomes	Activities
1.	What are they and what is the current state of genetic rasources for food and agriculture. What are they, what they do and what are gene banks for; Basic problems and challenges in creating and managing ex situ collections. Methods for characterizing the resources of gene banks. The most important methods of highthroughput analyses of DNA polymophism. Amplicon sequencing in chracterisation of genetic variation. The concept of core collection. Strategies and exmaples for practial use of the natural variation from geentic resources.	W1, W2, K1	Lecture
2.	Basic statistics used in the description of a population and in comparisions among populations. Basic methods of biostatistical analysis of data characterizing gene collections (genotyping results), such as, cluster analysis, principal coordinates analysis, analysis of molecular variance, assignement tests, Case study - overview and interpretation of the published results of biostatistical analyzes of genetic resources of selected crops.	U1, U2, U3, K1	Laboratory exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture, Conversation lecture, Discussion
Laboratory exercises	Case study, Presentation, Teamwork, Individual work, Laboratory (experiment), learning by experiment

Activities	Examination method	Percentage
Lecture	Written credit	45%
Laboratory exercises	Test (written or computer based)	22.5%
Laboratory exercises	Presentation	22.5%
Laboratory exercises	Assessment of activity during classes	10%

Activities	Credit conditions
Lecture	The condition for passing the course is to obtain a minimum of 51% from the written test
Laboratory exercises	The assessment of the learning outcomes consists of: 1- grade from the lectures (written form, test questions), 2- grade from the theoretical test from the exercises and from the practical pass from the exercises, 3 - grade from the presentation of case study, 4- evaluation of the student's ctivity during the classes. The condition for passing the course is to obtain a minimum of 51% from items 1, 2 and 3. The final grade is calculated as the sum of the points obtained for each element (taking into account their weight). The condition for passing the course is to obtain a minimum of 50% of the points, taking into account all the elements.

Literature

Obligatory

1. Molecular Ecology, JR Freeland, 2011. Wiley Blackwell
2. The Second Report on b teh State of the World's Plant Genetic Resources for Food and Agriculture. FAO 2011.
3. web sites indicated by the lecturer

Optional

1. Bioinformatics and Molecular Evolution, Higgs PG, Attwood T, 2005. Wiley-Blackwell
2. Phylogenetic Trees Made Easy. Hall BG, 2017 Oxford University Press
3. websites indicated by the lecturer
4. Publications indicated by the lecturer

Calculation of ECTS points

Activity form	**Activity hours***
Lecture	15
Laboratory exercises	15
Preparation for the exam	10
Preparation of a multimedia presentation	5
Preparation for exercises	5
Student workload	**Hours** 50
Number of ECTS points	**ECTS** 2

* hour means 45 minutes

Effects

Code	Content
BTj_K3_K01	The graduate is ready to proper storage of data, updating and extending knowledge on topics related to biotechnology and the related sciences;
BTj_K3_K02	The graduate is ready to development and application of one’s skills in practice (including communication, teamwork), which enable effective lifelong learning with respect to biological sciences;
BTj_K3_U04_inz	The graduate can present and discuss key principles of scientific interdisciplinary bases, as well as a multidisciplinary approach to the processes and mechanisms of life;
BTj_K3_U22	The graduate can find and assess information from various sources, including from original research, and present in a well organised manner (e.g. essays, reports and laboratory reports);
BTj_K3_W01_inz	The graduate knows and understands technologies of performing biotechnological processes
BTj_K3_W04	The graduate knows and understands the necessity to use proper simple computational techniques (including statistical analysis, computational tools and computer software suites) for biological data
BTj_K3_W07_inz	The graduate knows and understands experimental methods serving the examination of important areas in the field of biotechnology, chemistry, biochemistry, biophysics, molecular biology and the related sciences;
BTj_K3_W09	The graduate knows and understands living organisms and their place in the natural environment, and how they can be used for the good of humanity;
BTj_K3_W12	The graduate knows and understands the principles of mathematics and statistics for assessing and interpreting phenomena and processes occurring in the environment;