UNIWERSYTET PRZYRODNICZY WE WROCŁAWIU

Population genetics

Educational subject description sheet

Basic information

Field of study Bioinformatics **Speciality** - **Department** The Faculty of Biology and Animal Science **Study level** First-cycle programme **Study form** Full-time **Education profile** General academic	**Education cycle** 2020/21 **Subject code** WBiHZBBIS.L10BO.1750.20 **Lecture languages** English **Mandatory** optional **Block** major subjects (conducted) in foreign languages **Disciplines** Biological sciences **Subject related to scientific research** Yes **Subject shaping practical skills** No

Teacher responsible for the subject	Magdalena Zatoń-Dobrowolska
Other teachers conducting classes	Magdalena Zatoń-Dobrowolska

Period Semester 5	**Examination** graded credit **Activities and hours** lecture: 15 laboratory classes: 30	**Number of ECTS points** 3.0

Goals

C1	During the course, students become familiar with the issues related to population genetics.
C2	These issues are the balance of genetic population, as well as factors disrupting this state.
C3	Students learn methods for the analysis of changes in the genetic structure of the population.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the factors and mechanisms affecting the genetic structure of populations	BI_P6S_WG04, BI_P6S_WG05	written credit
W2	indicators of populations at a genetic level	BI_P6S_WG04	written credit
W3	the kinds of changes occurring in the population, their causes and consequences; understand the mechanisms affecting the genetic structure of populations and to know how can influenced it by various factors.	BI_P6S_WG04, BI_P6S_WG05	written credit
Skills – Student can:			
U1	define and analyze the factors and mechanisms that determine the genetic structure of populations	BI_P6S_UW06, BI_P6S_UW07	written credit, project
U2	characterize populations in terms of one gene and many genes	BI_P6S_UW06, BI_P6S_UW07	written credit, project
U3	Specify the types and directions of change in the population; can define their causes and analyze the consequences that they bring to the population	BI_P6S_UW06, BI_P6S_UW07	written credit, project

Balance of ECTS points

Activity form	Activity hours*
lecture	15
laboratory classes	30
lesson preparation	15
exam / credit preparation	15
consultations	2

Student workload	**Hours** 77	**ECTS** 3.0
Workload involving teacher	**Hours** 47	**ECTS** 1.8
Practical workload	**Hours** 30	**ECTS** 1.0

* hour means 45 minutes

Study content

No.	Course content	Activities

1.	Definition of population and random maiting - the Hardy-Weinberg principle. Change in the structure of the population under the influence of non-random mating - inheritance with incomplete dominance. Change in the structure of the population under the influence of non-random mating - inheritance with complete dominance. Factors changing the frequency of the gene: migration, mutation. Factors changing the frequency of the gene: selection, mutation and selection. Inbreeding: the structure of the population of the relationship matings, regular relationship maitings. Inbreeding - relationship coefficient and inbreeding coefficient. The theory of small populations: the impact of population size on its structure, coefficient of inbreeding in small populations. The theory of small populations: idealized population, effective population size. Changes in the medium under the influence of random and non-random maiting: inbreeding depression, heterosis. The quantitative trait and its variability: the phenotypic value, genotypic value, breeding value; variability of quantitative traits, the division of phenotypic variance into components. Intraclass similarity: the use of the notion of intraclass correlation in the description of the structure of the population, phenotypic similarity in groups of relatives. Genetic parameters characterizing the structure of the population: heritability, correlations between traits (phenotype, genetic, environmental). Change of quantitative traits under selection: natural selection and artificial, the reaction correlated trend genetic breeding progress, factors affecting the size of the breeding progress (accuracy of breeding value, the intensity of selection, genetic variation in the population, the gap of generations), correlated response, progression selection of inputs. The genetic distance between populations: the processes causing propagation of the population over time, path, and propagation mechanisms of the population. Methods for determining the size of the genetic distance and the creation of dendrograms.	lecture

2.	Determining the population structure of the subsequent generations non-random mating - type Pisum inheritance. Determining the population structure of the subsequent generations non-random mating - type inheritance Zea. Determining the structure of the population of the non-random mating generations - inherit some traits loci with series of allels, the case of varying frequency of alleles within sex. Calculation of changes in frequency of genes and genotypes as a result of migration, mutation. Calculation of changes in frequency of genes and genotypes as a result of the selection and the combined effect of mutation and selection. The method of Wright factor path. Determining the relationship between the variables - examples. Use of the method for determining parentage. Calculation of relationship and inbreeding coefficients based on pedigrees. The determination of the effective population size and growth rate of inbreeding. Methods of estimating genetic parameters - heritability, genetic correlation: regression intraclass correlation intraclass. Determining the accuracy of statistical estimators. Estimation of the genetic value using various models. The coefficients characterizing loci. Calculation of Het, describing PIC informatyczność respective loci. Estimating genetic distance between populations based on data obtained for different types of markers. Plotting phylogenetic trees. Linkage genes.	laboratory classes

Course advanced

Teaching methods:

lecture, classes

Activities	Examination methods	Percentage in subject assessment
lecture	written credit	50%
laboratory classes	written credit, project	50%

Literature

Obligatory

1. HALLIBURTON R.: Introduction to population genetics. Pearson, Prentice Hall, New Jork 2004
2. FALCONER D.S., MACKAY F.C. 1997: Introduction to quantitative genetics. Longman, Harlow 1997

Effects

Code	Content
BI_P6S_UW06	Absolwent potrafi stosować metody informatyczne do opisu i interpretacji wyników uzyskanych w analizie danych biologicznych i hodowlanych
BI_P6S_UW07	Absolwent potrafi przeprowadzać obserwacje oraz wykonywać w terenie lub laboratorium pomiary biologiczne służące rozwiązaniu problemów biologicznych i zootechnicznych oraz wykorzystywać publicznie dostępne bazy danych
BI_P6S_WG04	Absolwent zna i rozumie mechanizmy ewolucji
BI_P6S_WG05	Absolwent zna i rozumie w stopniu zaawansowanym zagadnienia z zakresu praw genetyki klasycznej, molekularnej, populacyjnej oraz cytogenetyki