

## SYLLABUS

Name of the course (as specified in the approved curriculum) Module 4 – Data Science and Bioinformatics			Number of ECTS credits 8
Name of the course in Polish Analiza Danych i Bioinformatyka			
Unit providing the course Department of Genetics and Animal Breeding			
Course co-ordinator prof. dr hab. Maciej Szydlowski			
Field of study Animal Production Management	Level II – master studies	Profile Academic-general	Semester 1
<b>TYPE OF CLASSES AND COURSE LOAD (Classes with teacher and student's own work)</b>			
Mode of studies: full-time		Mode of studies: part-time	
- lectures	30	- lectures	-
- practical classes	60	- practical classes	-
- field classes	0	- field classes	-
- labs	0	- labs	-
- consultations	5	- consultations	-
- own student's work	100	- own student's work	-
- others	5	- others	-
Total number of hours		200	Total number of hours
<b>OBJECTIVE OF THE COURSE</b>			
This module demonstrates how modern computer-aided methods in statistics and bioinformatics can be applied to analyze records on animal phenotypes and genomes. Students will develop skills to analyse animal data.			
<b>TEACHING METHODS</b>			
Lectures: - Presentation with the use of a multimedia presentation - Interactive Q&A Classes: - Hands-on experience: students get direct practice with software and coding - Peer-to-peer support: Students learn from and help each other, fostering collaboration			
<b>Course learning outcomes</b>			The reference to the study field learning outcomes
Knowledge	O1: Student knows and understands the advanced aspects of statistics		AP2A_W01 AP2A_W03
	O2: Student knows and understands the rules of experimental data analysis, hypothesis testing, and experimental design		
	O3: Students know and understand selected methods of bioinformatics		
Skills	O4: Student is able to plan, design, and statistically analyze experiments on animals and assess the significance of the examined factors. The student elaborates on and analyzes observational data on animals.		AP2A_U01 AP2A_U02 AP2A_U03 AP2A_U12
	O5: Student is able to design simple experiments on farm animals, analyze experimental data, and perform basic statistical inference		
	O6: The student uses scientific reports that include statistical analyses of data collected from animals.		
	O7: Student is able to critically analyze and interpret information from archives of DNA and protein sequences		

Social competences	O8: The graduate is aware of the importance of statistical methods in the objective assessment of the effects of environmental and genetic factors on animal health and performance.	AP2A_K01
<b>Methods for verifying learning outcomes</b>  Formative - oral summary of what has been explained Summative: - Written exam		Symbols of course learning outcomes O1-O3 O2-O7 O1-O8
<b>TEACHING CONTENTS</b>  Lectures: Data Management: R Environment. Data management in R. Graphics in R. Experimental design: Variables and probability distributions. Measures of central tendency and variability. Estimation. Statistical hypothesis. Selected parametric and nonparametric tests. Power of some statistical tests and determining sample size. Statistical models and inference on their parameters. Matrix algebra. Analysis of variance and regression. Data transformations. Principles of bioinformatics: Sequence alignment. BLAST. Patterns, motifs, and domains. Genotyping by resequencing. ENSEMBL. Prediction of RNA structure. Classes: Data Management: R Environment. Data management in R. Graphics in R. Experimental design: Descriptive statistics. Estimation. Selected statistical tests. Determining sample size. Matrix algebra. Analysis of variance and regression. Principles of bioinformatics: Sequence alignment. BLAST. Patterns, motifs, and domains. ENSEMBL. Prediction of RNA structure.		
<b>Forms and criteria for completing the course</b>  Summative evaluation: - final assignment - written exam		Percentage of a final grade 50% 50%
<b>Literature list</b>  Core literature Ott L. An introduction to statistical methods and data analysis. PWS Publishers, Boston <a href="#">Andreas D. Baxevanis</a> (Ed), <a href="#">B. F. Francis Ouellette</a> (Ed): <a href="#">Bioinformatics</a> : A Practical Guide to the Analysis of Genes and Proteins. Publisher: Wiley, John & Sons, Incorporated  Additional sources printed and electronic material provided by lecturers R manuals NCBI online training materials in HTML, PDF and Video formats		