MODULE DESCRIPTION (SYLLABUS)

1.	Module: **Genetics**
2.	Language of instruction: **English**
3.	Faculty: **Faculty of Biotechnology**
4.	Course/module code: **29-BT-S1-E3-EnG** (Lect.) **29-BT-S1-E3-EnGc** (Lab.)
5.	Course/module type (*mandatory* or *elective*): **mandatory**
6.	Programme: **Biotechnology**
7.	Study cycle (*1st/2nd*): **1st cycle**
8.	Year: **2nd**
9.	Semester *(autumn* or *spring):* **autumn**
10.	Form of tuition and number of hours: Lecture: **30 h** Laboratory: **30 h**
11.	Coordinator(s): **Dorota Mackiewicz, PhD**
12.	Initial requirements *(knowledge, skills, social competences):* **Basic biochemistry of proteins and nucleic acids, basic classic genetics, basic statistics. Knowledge of laboratory practice, related laws and regulations. Ability to work in a team.**
13.	Objectives: Lect.: **Acquaintance with terminology used in genetics – from Mendelian genetics to molecular genetics. To introduce students into the field of contemporary genetics: structure of genomes, chromosomes and genes, mechanisms and control of expression genetic information, and mechanisms of evolution of genetic pool.** Lab.: **Acquaintance with terminology used in genetics by performing experiments on model**

	organisms (e.g. fruit fly, yeast). Planning, realization and analysis of genetic crosses. Inference about gene location based on analysis of gene linkage. Practical genetic exercises. Analysis of mutagens' effects on genetic material. The basic assessment of genetic pool in population.	
14.	Content: Lect.: **The principles of inheritance and the chromosomal basis of heredity, extensions of Mendelism. Gene linkage, crossing over, and genetic mapping. Two rules of probability. Chi-Square analysis. Double helix structure. DNA replication and replication associated mutational pressure. Molecular mechanisms of mutation and DNA repair. DNA asymmetry and its consequences for functional structure of chromosomes and evolution. Structure of prokaryotic and eukaryotic genes and chromosomes. Mechanisms of transcription and translation. The genetic code and its properties and alternatives. Regulation of gene expression. The genetics of bacteria and their viruses. DNA recombination mechanisms. Sex chromosomes and sex determination. The evolution of Y chromosomes. The genetic basis of cancer.** Lab.: **This course practically shows: the principles of inheritance of genetic information according to Mendel's laws and their violations. Chromosomal theory of inheritance. Mitotic and meiotic cell division from genetic point of view. The structure of chromosomes. Genetics of *Drosophila melanogaster* – practical application of genetics laws in genetic crosses. Sex-linked inheritance, sex-limited inheritance and sex-influenced inheritance. Genetics of *Saccharomyces cerevisiae* – complementation test and meiotic mapping. Cytoplasmic inheritance. Sources of genetic variation. Types of mutations. Characteristics of tests used in detection of mutagenic factors. Basic knowledge of population genetics - Hardy-Weinberg law and the measurement of frequency of alleles in population.**	
15.	Learning outcomes: Student: • **can make a qualitative and quantitative description of the basic biological phenomena and processes;** • **knows and understands the importance of mathematical and statistical methods required for the description, interpretation of phenomena and processes, as well as biological experiments;** • **is familiar with the basic principles of health, safety and ergonomics procedures in the laboratory; knows procedures of work with genetically modified organisms;** • **can take advantage of the online resources and the literature to obtain information on genetics** • **carries out simple experiments or research expertise under the guidance of a tutor in the**	Outcome symbols: K1_W01 K1_W02, K1_W03 K1_W010 K1_U04 K1_U05

	field of genetics can describe the results and present them in the form of a report; • **uses basic statistical methods and computer technology to describe biological phenomena and analysis of experimental data;** • **makes the synthesis of information from various sources and is capable of correct conclusions based on them;** • **uses proper scientific language and terminology in discussions of genetic problems;** • **understands the need for careful planning of tasks and scientific experiments;** • **recognizes ethical problems associated with genetics;** • **knows and follows the rules of health and safety at laboratory work.**	K1_U06 K1_U08 K1_U09 K1_K03 K1_K04 K1_K05
16.	Recommended literature: • **Genetics, Analysis of Genes and Genomes, 9th Edition, Daniel L. Hartl, Bruce Cochrane. Burlington, MA: Jones & Bartlett Learning, 2019.** • **Essential Genetics and Genomics, 7th Edition, Daniel L. Hartl. Jones & Bartlett Publishers, Inc 2020** • **Principles of Genetics, 7th Edition, D. Peter Snustad, Michael J. Simmons. Wiley, 2016** • **Lewin's GENES XII, Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick. Jones & Bartlett Learning, 2017** • **Getting started with yeast. Fred Sherman. Methods Enzymol. 350: 3-41, 2002.** • **Revised methods for the Salmonella mutagenicity test. Maron and Ames. Mut. Res., 113: 173-215, 1983.**	
17.	Methods of verification of the assumed learning outcomes Lect.: • **written exam (student should very shortly answer 20 questions).** Lab.: • **two "midterm" tests, and final test including the theoretical knowledge and the solution of genetic problems. Quality of carried out experiments and ability of their interpretation. Presentation of results from experiments in reports.**	
18.	Conditions of earning credits: • **Active participation in laboratory classes and correct performance of experiments.** • **Completion of the laboratory classes is also based on "midterm" and final tests' and laboratory reports' results.** • **Completion of the lecture is based on a written exam.**	

19.	Student's workload:	
	Activity	Number of hours for the activity
	Hours of instruction (as stipulated in study programme) : • Lect.: **30 h** • Lab.: **30 h**	60 h
	Student's own work: • preparation before classes: **10 h** • reading the literature: **10 h** • writing laboratory reports: **5 h** • preparation for the tests: **15 h** • preparation for the final exam: **20 h**	60 h
	Total number of hours:	**120 h**
	Number of ECTS: • Lect.: **3 ECTS** • Lab.: **2 ECTS**	**5 ECTS**