

# General Genetics - opis przedmiotu

| Informacje ogólne   |                                            |
|---------------------|--------------------------------------------|
| Nazwa przedmiotu    | General Genetics                           |
| Kod przedmiotu      | 13.9-WB-OS2P-GeneOg-S17                    |
| Wydział             | <a href="#">Wydział Nauk Biologicznych</a> |
| Kierunek            | Environmental Protection                   |
| Profil              | ogólnoakademicki                           |
| Rodzaj studiów      | pierwszego stopnia z tyt. licencjata       |
| Semestr rozpoczęcia | semestr zimowy 2022/2023                   |

| Informacje o przedmiocie        |                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Semestr                         | 5                                                                                                                      |
| Liczba punktów ECTS do zdobycia | 4                                                                                                                      |
| Typ przedmiotu                  | obowiązkowy                                                                                                            |
| Język nauczania                 | angielski                                                                                                              |
| Sylabus opracował               | <ul style="list-style-type: none"><li>dr Andrzej Jurkowski</li><li>dr hab. Katarzyna Baldy-Chudzik, prof. UZ</li></ul> |

| Formy zajęć  |                                         |                                        |                                            |                                           |                     |
|--------------|-----------------------------------------|----------------------------------------|--------------------------------------------|-------------------------------------------|---------------------|
| Forma zajęć  | Liczba godzin w semestrze (stacjonarne) | Liczba godzin w tygodniu (stacjonarne) | Liczba godzin w semestrze (niestacjonarne) | Liczba godzin w tygodniu (niestacjonarne) | Forma zaliczenia    |
| Wykład       | 30                                      | 2                                      | -                                          | -                                         | Egzamin             |
| Laboratorium | 30                                      | 2                                      | -                                          | -                                         | Zaliczenie na ocenę |

## Cel przedmiotu

The objective of the course is to get the student acquired knowledge of the structure and organisation of genetic material and of relations between its structure and function. To get the student acquainted with the basic mechanisms of genetic material expression and the basics of chromosomal theory of inheritance (Mendel's laws, mitosis, meiosis) and exceptions from the rules. To acquire knowledge of mutations and the occurrence of mobile genetic elements. To acquire basic knowledge of population genetics. Within the laboratory classes the student is acquainted with the basic safety rules in a genetic-type laboratory. The student should be able to perform independently simple experiments in the field of classical genetics. The student should be able to solve tasks in genetics as well as to critically analyze and interpret the results of the carried out experiments.

## Wymagania wstępne

Knowledge of biology, chemistry, biochemistry required within the program of secondary education

## Zakres tematyczny

Lecture: The subject and the domain of genetics. Watson and Crick's model of DNA and the functions of genetic material. Chemical nature of polynucleotide. The organisation of the genetic material in Prokaryotes and Eukaryotes. Replication and recombination. Basics mechanisms of DNA synthesis. Mechanisms and forms of recombination. Basics of transcription. Detailed transcription mechanism. Operons – basic units of gene expression in bacteria. Transcription termination. The structure and expression of an eukaryotic gene. Chromatin structure. RNA polymerase and its role. Gene promoters – transcription regulation, DNA-protein interactions, translation. Relations between genes and proteins, ribosomes – functions of ribosome protein. Transfer RNA. Genetic code. Translation mechanisms. Chromosomal theory of inheritance and its basis e.g. Mendel's laws as well as mitosis and meiosis. Evidence for chromosomal theory of inheritance; sex related features. Exceptions from Mendel's laws: incomplete dominance, gene epistasis, lethal genes, maternal effect, gene linkage. Chromosomal maps and the notion of linkage groups. Gene mutation and inborn errors of metabolism. Complementation testing – analysis of location of cis-trans alleles. Point and genomic mutations. Mobile genetic elements. Basics of population genetics Hardy-Weinberg Law.

Laboratory: Introduction to genetics - *Drosophila melanogaster* as an example of the object of genetic tests. Meiosis. Mutants of *Drosophila melanogaster*. 1st and 2nd Mendel's laws. Interaction between alleles within the same gene. Multiple alleles. Lethal and sub-lethal alleles. Pleiotropic genes. Interaction between non-allelic genes. Epistasis and genetic tasks in it. Inheritance of coupled and sex-related features, sex determination and genetic tasks in it. Gene linkage. Gene Mapping and genetic tasks in it. Complementation. Discussion and interpretation of the results of *D. melanogaster* mutants.

## Metody kształcenia

- Lecture in a form of multimedia presentations

- Practical method – laboratory classes (with the use of binoculars and magnifiers as well as a collection of *D. melanogaster* mutants).

## Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

| Opis efektu                                                                                                                                                                                                                   | Symbole efektów                                                         | Metody weryfikacji                                                                          | Forma zajęć                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| The student applies the ergonomics principles of work, plans and carries out experiments, is able to apply the research methods, interpret the results and draw the conclusions. Applies acquired skills in work environment. | <ul style="list-style-type: none"><li>K1A_K25</li><li>K1A_K33</li></ul> | <ul style="list-style-type: none"><li>aktywność w trakcie zajęć</li><li>kolokwium</li></ul> | <ul style="list-style-type: none"><li>Laboratorium</li></ul> |

| Opis efektu                                                                                                                                                                     | Symbole efektów                                                                                                | Metody weryfikacji                                                                                                                                     | Forma zajęć                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Applies self-study method and understands the need to master their knowledge and skills in genetics.                                                                            | <ul style="list-style-type: none"> <li>• <a href="#">K1A_K03</a></li> <li>• <a href="#">K1A_K07</a></li> </ul> | <ul style="list-style-type: none"> <li>• aktywność w trakcie zajęć</li> <li>• kolokwium</li> </ul>                                                     | <ul style="list-style-type: none"> <li>• Wykład</li> <li>• Laboratorium</li> </ul> |
| The student can work in a group and organise work within a determined range, listens to teacher's remarks and follows their instructions.                                       | <ul style="list-style-type: none"> <li>• <a href="#">K1A_U12</a></li> <li>• <a href="#">K1A_U24</a></li> </ul> | <ul style="list-style-type: none"> <li>• aktywność w trakcie zajęć</li> <li>• obserwacja i ocena aktywności na zajęciach</li> </ul>                    | <ul style="list-style-type: none"> <li>• Laboratorium</li> </ul>                   |
| Students possess the knowledge of basics of genetics and understands the structure and functions of genetic material as well as the laws and mechanisms of feature inheritance. | <ul style="list-style-type: none"> <li>• <a href="#">K1A_W17</a></li> </ul>                                    | <ul style="list-style-type: none"> <li>• egzamin - ustny, opisowy, testowy i inne</li> <li>• kolokwium</li> </ul>                                      | <ul style="list-style-type: none"> <li>• Wykład</li> <li>• Laboratorium</li> </ul> |
| The student explains the principles of applying the techniques of classical genetics and possesses the knowledge of usage laboratory equipment.                                 | <ul style="list-style-type: none"> <li>• <a href="#">K1A_W10</a></li> </ul>                                    | <ul style="list-style-type: none"> <li>• aktywność w trakcie zajęć</li> <li>• obserwacje i ocena umiejętności praktycznych studenta</li> </ul>         | <ul style="list-style-type: none"> <li>• Laboratorium</li> </ul>                   |
| The student is able to use the literature and other sources (e-learning), to interpret the results and to combine them into a coherent entity.                                  | <ul style="list-style-type: none"> <li>• <a href="#">K1A_U08</a></li> </ul>                                    | <ul style="list-style-type: none"> <li>• aktywność w trakcie zajęć</li> <li>• egzamin - ustny, opisowy, testowy i inne</li> <li>• kolokwium</li> </ul> | <ul style="list-style-type: none"> <li>• Wykład</li> <li>• Laboratorium</li> </ul> |

## Warunki zaliczenia

### Verification of learning outcomes and credit conditions:

Lecture – final exam in a written form, which student takes after having obtained a credit for classes. The exam lasts 90 min. and consists of 60 closed questions. Positive grade is granted after obtaining above 39 points (65%) out of 60 points.

Laboratory - The credit is granted after all experiments to be realized within the laboratory program are performed and positively evaluated. The evaluation includes: presence, tests (open and closed) – positive grade is granted after having obtained above 60% of points, the ability to carry out fruit fly crossing. The final grade is the arithmetic mean of partial grades.

## Literatura podstawowa

1. W.S. Klug & M.R. Cummings, Concepts of Genetics, A Bell & Howell Publishing Company

2 T.A. Brown, Genomes, Garland Science Taylor & Francis Group

## Literatura uzupełniająca

- A. Sadakierska-Chudy, G. Dąbrowska, A. Goc, Genetyka ogólna. Skrypt do ćwiczeń dla studentów biologii, Wydawnictwo Uniwersytetu Mikołaja Kopernika, Toruń 2004.
- P.C. Winter, G.I. Hickey, H.L. Fletcher, Krótkie wykłady. Genetyka, Wydawnictwo Naukowe PWN, Warszawa 2004
- W. Gajewski, Genetyka ogólna i molekularna, Wydawnictwo Naukowe PWN, Warszawa 1987.
- B. Piątkowska, A.Goc, G. Dąbrowska, Zbiór zadań i pytań z genetyki, część I. Genetyka ogólna, Wydawnictwo Uniwersytetu Mikołaja Kopernika, Toruń 1998.

## Uwagi

Zmodyfikowane przez dr Olaf Ciebiera (ostatnia modyfikacja: 20-04-2022 09:15)

Wygenerowano automatycznie z systemu SylabUZ