SYLLABUS

Name: ***Population Genetics (BioAu>SM3PG20)***
Name in Polish:
Name in English: ***Population Genetics***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

https://platforma2.polsl.pl/rau1/course/view.php?id=408

Short description:

The goal of the course is to give students knowledge concerning basic models of population genetics, i.e. Wright-Fisher model of genetic drift, mutation-drift equilibrium model, natural selection models (underdominance, overdominance, directional) as well as coalescence, in particular in applications to generation artificial samples composed of genomic sequences with distributions comparable to those present in natural populations. Additionally, the course shows importance of genetic diversity in natural samples and its sources in population demography, when the population is subject to evolution process responsible for variation observed.

Description:

ECTS: 3
Total hours: 75 h (contact: 45 h / individual work: 15 h)
Lecture: 30 h
Laboratory: 15 h

Student's individual work: preparation of reports, preparation for quizzes and the final test

Lectures:
1. Introductory lecture
2. Hardy-Weinberg principle
3. Mutations and genetic drift
4. Inbreeding and natural selection
5. Population structure and migrations
6. Neutral theory and coalescence
7. Phylogenetics and the introduction to human demography
8. Human demography
9. Special Topic 1 - Evolution of Coronaviruses
10. Special Topic 2 - Glimpses into evolutionary diseases

Laboratories:
1. Genetic drift
2. Natural selection
3. Phylogenetic trees/Criminology
4. Models of population migration
5. Make-up lab
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Bibliography:

Gilespie J.H., Population Genetics – A Concise Guide, The John Hopkins University Press, Baltimore and London, 1998
Wakeley J., Coalescent: An Introduction. W.H. Freeman, 2008

Hartl D.L., Clark A.G., Principles of Population Genetics, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, 3rd Edition, 1997
Hartl D.L., A Primer of Population Genetics and Genomics 4th Edition. Oxford University Press, 2020.

Learning outcomes:

1. The student knows Wright-Fisher model of genetic drift: K2A_W19
2. The student knows basic concepts in population analysis: genetic drift, mutation, selection, coalescence, effective population size: K2A_W03
3. The student knows the influence of the reproduction models on the effective population size: K2A_W03, K2A_W19, K2A_U08
4. The student knows types and properties of natural selection working at the molecular level: K2A_W03, K2A_W09
5. The student can determine the type of selection on the basis of model parameters: K2A_U07, K2A_U08
6. The student can determine the distribution of coalescence time for constant population: K2A_U10
7. The student can run computer simulations for coalescence models aiming at generating samples of artificial genetic sequences: K2A_W04, K2A_U07, K2A_U10, K2A_K03
8. The student can efficiently use English literature sources: K2A_U02, K2A_U03, K2A_U06, K2A_K04

Assessment methods and assessment criteria:

Completion of the course (lecture + laboratories) is based on the assessment of reports from laboratories and grades from the quizzes conducted during the lecture.

The final grade is calculated as 80% of the arithmetic mean of the laboratory grades + 20% of the arithmetic mean of the quizzes' grades.

The syllabus is effective from the summer semester of the 2025/2026 academic year and its content is not subject to change during the semester.
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Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2020/2021-L	