

| Course code | Course group | Volume in ECTS credits | Course hours |
|-------------|--------------|------------------------|--------------|
| BIO4030 | C | 5 | 130 |

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| Course type (compulsory or optional) | Optional |
| Course level (study cycle) | I cycle |
| Semester the course is delivered | Spring |
| Study form (face-to-face or distant) | Face-to-face |

Course title in Lithuanian

EPIGENETIKA

Course title in English

EPIGENETICS

Short course annotation in Lithuanian

Šis kursas skirtas suteikti žinių studentams apie epigenetikos ir epigenomikos mokslo raidos etapus, šiuolaikines kryptis ir problemas. Šio kurso metu studentai bus supažindinami su skirtingais genų ekspresijos epigenetinės kontrolės mechanizmais, epigenomo pokyčiais normaliose ir patogeninėse ląstelėse, suvoks kokios yra galimybės perprogramuoti ląsteles ir priversti funkcionuoti nutildytus genus, kodėl ir kaip senelių gyvenimo būdas, bei mityba gali paveikti anūkų gyvenimus.

Short course annotation in English

This course provides knowledge about the current trends and problems in epigenetics and epigenomics science; the human genome, chromosome, gene structure, function, principles of inheritance and variability and their impact on the phenotype; heritability of normal and pathological symptoms/diseases, inheritance of human heredity diseases and modern diagnostic capabilities; teratogen effects on the embryo and the possibilities of prenatal diagnosis and genetic counseling of families.

Prerequisites for entering the course

General biology, general genetics.

Course aim

Being able to define main epigenetics concepts and development of epigenetics science field. To describe gene expression and epigenetic control mechanisms in conventional cells, epigenetic modification types and importance of epigenetics in ontogenesis. To understand the difference in dose compensation between mammals, flies and worms. Describe genomic imprinting mechanisms and their effects on phenotypic expression. Identify the effects of environmental factors on the epigenome.

Content (topics)

1. Development of epigenetic science, contemporary trends and problems, discoveries and achievements.
2. Epigenetic control of gene expression.
3. Epigenetic markers and their inheritance mechanism.
4. The importance of epigenetic control in pre- and postnatal ontogenesis.
5. Epigenetic changes and nucleus organization.
6. Chromatin Structure and Packing Mechanism.
7. Nucleus 3D organization and overview of epigenetic tags.
8. Inactivation of X chromosomes in mammals.
9. Dose compensation mechanisms in flies and worms.
10. Genome imprinting.
11. Epigenetic reprogramming of mother-father genome.
12. Environmental effects on epigenetic control.
13. Epigenetic reprogramming of cells.

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| 14. Epigenetic inheritance from generation to generation. |
| 15. The role of epigenetic heredity in the treatment of nerve diseases. |
| 16. Cancer epigenetics. |
| 17. The Epigenetic Drug Industry. |

Distribution of workload for students (contact and independent work hours)

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| Lectures – 45 hours, laboratory work – 22,5 hours, individual work – 62,5 hours. Total 130 h. |
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Structure of cumulative score and value of its constituent parts

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| Final assessment sums the assessments of written final examination (50%), written mid-term examination (25%) and assessment of laboratory works (25%). |
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Recommended reference materials

| No. | Publication year | Authors of publication and title | Publishing house | Number of copies in | | |
|------------------------|------------------|---|------------------------------------|---------------------|------------------|-----------------|
| | | | | University library | Self-study rooms | Other libraries |
| <i>Basic materials</i> | | | | | | |
| 1. | 2011 | Hallgrímsson B. & Hall B. K. Epigenetics: Linking Genotype and Phenotype in Development and Evolution. Press: https://muse.jhu.edu/book/25880 | Berkeley: University of California | | | |
| 2. | 2013 | Sweatt J. D., Nestler E. J., Meaney M. J., Akbarian S. An Overview of the Molecular Basis of Epigenetics: In Epigenetic regulation in the Nervous system. http://w3.biosci.utexas.edu/atkinson/Epigenetics2014/Epigenetics2014/Readings_files/Ch%201%20Overview.pdf | Elsevier: USA | | | |
| 3. | 2012 | 2012 Tollefsbol T. (ed.). Epigenetics in Human Disease http://epigenetics.com.ua/wp-content/uploads/Publications/2012_BOOK-EPIGENETICS-IN-HUMAN-DISEASE.pdf | Elsevier: USA | | | |

Course programme designed by

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| Dr. Vaida Tubelytė, Faculty of Natural Sciences, Department of Environmental Sciences |
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