DESCRIPTION OF THE COURSE TITLE (For Group C)

Course code	Course group	Volume in ECTS credits	Course valid from	Course valid to	Reg. No.
BIO 5001		6			

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

Short course annotation in Lithuanian (up to 500 characters)

Course type compulsory	
Course level (study cycle) II cycle	
Semester the course is delivered autumn	
Study form (face-to-face or distant) face-to-face	

Course title in Lithuanian

Molekulinė bilogija

Course title in English

Molecular biology

Short course annotation in Lithuanian (up to 500 characters)

Įsisavinti organizmų funkcionavimo ir paveldimumo molekulinius pagrindus, susipažinti su įvairių organizmų genomais, išnagrinėti nukleorūgščių organizaciją ląstelėje, įsisavinti genetinės informacijos perdavimo ir jos realizacijos mechanizmus: DNR ir chromosomų replikacija, genų ekspresijos reguliaciją, RNR biosintezę bei jos brendinimą, baltymų biosintezę, jų postransliacinį modifikavimą, temperatūrinio šoko baltymų sintezės mechanizmus, pagrindinius eukariotinių ląstelių signalo perdavimo kelius ir būdus.

Short course annotation in English (up to 500 characters)

The course is designed to acquaint the students with the molecular fundamentals of functioning and hereditability of organisms, to acquaint them with the genomes of different organisms, to investigate organization of nucleoacids in the cell. The students are acquainted with the following mechanisms of transmission of genetic information and its realisation: DNA and chromosome replication, regulation of gene expression, RNA biosynthesis and its maturation, biosynthesis of proteins and their post-translational modification, mechanisms of the heat shock of protein synthesis, major ways and methods of transmission of the signal of eukaryotic cells.

Prerequisites for entering the course

General genetics, biology of cells, biochemistry

Course aim

To acquaint the students with the main objects of investigation used in molecular biology, methods of investigation and to discuss major problems of molecular biology and achievements in this field.

Links between the study programme outcomes, the course outcomes and the criteria of learning achievement evaluation

Study programme outcomes	Course outcomes	Criteria for learning achievement evaluation

Highest	9-10	Are capable of solving molecular biology problems and of thinking analytically. Have no difficulty in using molecular biology terminology, understand basic laws and regularities of molecular biology, perform at least 90% of tasks in the final work; answers to the questions and solutions of the problems are acceptable, motivated and well-reasoned.
Average	7-8	More than two thirds of all the tasks are performed; answers to the questions and solutions of the problems are acceptable, motivated and well-reasoned.
Necessary minimum	5-6	A necessary minimum level of achieving the outcomes; more than half the tasks are performed; answers to the questions are in essence acceptable, the most necessary theoretical knowledge are demonstrated..
Unsatisfactory	4-2	Answers to the questions are unacceptable; the tasks are performed wrongly; neither minimum necessary theoretical knowledge nor practical skills are demonstrated.
...		

Link between course outcomes and the content

Course outcomes	Content (topics)
The students will acquire knowledge of the nature of genetic material, a spatial and molecular structure of nucleoacids, the molecular structure of separate parts of chromosomes, the peculiarities of the genome of somatic cells, dimerisation of molecules, proteins of cell interaction and signal transmission, molecules of cell adhesion, peculiarities of regulation of eukaryote gene expression, the role of miRN in regulation of gene expression, maturation (processing) of RNR and the importance of this process to RNR biological functions, proteins of heat (temperature) shock and their biological significance, synthesis and functions of prion proteins, the structural organisation of prion proteins and their genes, the variety and specific specificity of prion **Upon completion of the study course the student shall perceive the following:** 1. What the spatial structure of nucleoacids, DNA species and functions, the structure of eukaryote genes and elements regulating it, and the peculiarities of the genome of the somatic cells are.	1. Review of the development of molecular biology. Nature of genetic material. Hereditary molecules. DNA primary sequence. 2. Spatial structure of nucleoacids. DNA species, function. 3. Structure of the gene of eukaryotes and elements regulating it. 4. The molecular structure of chromosomes and its significance. Chromatin of chromosomes, chromosome domains, the structure of chromatin in the interphase nucleus of eukaryotes, peculiarities of prokaryote chromosomes, heterochromatin, chromosomes of specific structure, special parts of the chromosome, artificial chromosomes. 5. Peculiarities of the genome of somatic cells. 6. General peculiarities of transmission of the cell signal. Cell interaction and signal transmission molecules. Dimerisation of proteins, cell adhesion molecules. 7. DNA reparation, recombination and transposition of eukaryotes and prokaryotes. 8. DNA transcription of eukaryotes and prokaryotes, its stages, and regulation. 9. Genetic control of DNA replication of eukaryotes and prokaryotes. 10. Transmission of genetic information of eukaryotes in the cells. 11. Genetic control of DNA synthesis of eukaryotes.

2. they will understand the peculiarities regulating the eukaryote gene expression, the role of miRNR in expression regulation. 3. they will understand the process of RNR maturation (processing) and the importance of this process to RNR biological functions. 4. they will understand the structure of heat (temperature) shock of proteins, mechanisms of biosynthesis and their biological significance, mechanisms of switching the heat shock genes for the synthesis of these proteins in a cell. **Upon completion of the study course the student will be able to:** **a)** explain major conceptions of molecular biology science, analyse regularities of transmitting information in eukaryotic cells, explain DNA reparation, recombination and transposition of eukaryotes. **b)** understand DNR transcription of eukaryotes, its stages, regulation, genetic control of replication, transmission of genetic information in eukaryotes. **c)** the students will be able to assess dimerisation of the molecule, protein of cells interaction and signal transmission, molecules of cell adhesion. **d)** The students will understand molecular biology investigation methods and will know how to use them purposively in scientific research. **e)** they will be able to apply knowledge of molecular biology in studying other subjects of the study programme.	12. Peculiarities of regulating gene expression of eukaryotes and prokaryotes. 13. The role of miRNR and siRNR in regulation of gene expression. 14. RNR maturation (processing). The importance of this process to biological functions of RNR. 15. Heat (temperature) shock proteins and their biological significance. The general structure of heat (temperature) shock proteins, the cell switching mechanism for the synthesis of heat shock proteins under the effect of temperature, he function of heat shock proteins and homological proteins being synthesised at normal temperature, proteins of plant stress, chaperons and heat shock proteins. 16. Prion proteins (prions) ands their properties. Synthesis and functions of prion proteins, structural organisation of prion proteins and their genes, the variety and specific specificity of prion proteins, interspecific heredity of the genes of prion proteins. *Laboratory work* 1. Safe work in the laboratory. Rules of good laboratory practice. Specificity of work when working at a molecular biology laboratory. 2. The structure of hereditary units: the structure of a chromosome, the structure of DNA (chromosome→nucleosome→DNA). Gene. Genetic code. Human genome: nuclear DNA and mitochondrial DNA. Combination of two genes. 3. DNA isolation. 4. Determination of DNA purity and concentration. 5. DNR doubling – replication. Molecular investigation methods. Assurance of quality control of molecular methods. 6. DNA polymerase chain reaction (PCR). 7. Electrophoretic fractionation and visualisation of the DNA fragment.

Study (teaching and learning) methods

Lectures and practical classes, seminars, independent work.

Methods of learning achievement assessment

The assessment of the students' knowledge is carried out in the cumulative system and consists of three components: intermediary testing and an examination in writing providing each student with the cards containing similar questions. The results of the examination are assessed only after all practical works have been completed and accounted for, as well as after the intermediary testing has been carried out.

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

45 hours of lectures

15 hours of laboratory work
3 hours of assessment of knowledge
82 hours of independent work

Structure of cumulative score and value of its constituent parts

The assessment of the student's knowledge is carried out in the cumulative system and consists of three components:
The colloquium after laboratory works and practical work have been completed accounts for 17% of the final grade.
Intermediary testing accounts for 33% of the final grade. The examination accounts for 50% of the final grade.

Recommended reference materials

No.	Publication year	Authors and the title of publication	Publishing house	Number of copies in		
				University library	*Self-study rooms*	*Other libraries*
Basic material						
1.	2012	David Clark et. al., Molecular biology	USA	1		
2.	2011	L. H. Hartwel. **Genetics**. From Genes to Genomes	McGRAW – HILL	2	unavailable	5
3.	2005	Ed. D.P.Clark. Elsevier, Molecular Biology. Understanding the genetic revolution	London	2	unavailable	3
4.	2008	Rančelis V. Augalų genetika	Kaunas. „Technologija"	3	1	10
Additional literature						
1. 2.	2005. 2002.	Mildažienė ir kt. Ląstelės biologija. Miceikienė I., Paulauskas A. ir kt. Genetikos praktikumas. DNR polimorfizmo tyrimo metodai.	Kaunas Kaunas	10	5	15

Course programme has been prepared by:

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