

Course code	Course group	Volume in ECTS credits	Course hours
BIO 6007	C	6	160

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

#### Course title in Lithuanian

**BIOTECHNOLOGIJA MEDICINOJE**

#### Course title in English

**BIOTECHNOLOGY FOR MEDICINE**

#### Short course annotation in Lithuanian

Dalykas skirtas supažindinti studentus su moderniais biotechnologijų taikymais medicinoje. Studijų metu studentai įgys žinių apie genų terapijos metodus, taikymus, perspektyvas. Taip pat bus supažindinami su genų raišką slopinančių RNR molekulių taikymais, genų raiškos tyrimo metodais, mikrogardelių technologijomis, kamieninių ląstelių technologijomis ir perspektyvomis, kaulų čiulpų transplantacijos technologijomis, dirbtinio apvaisinimo būdais, prenatalinės diagnostikos metodais.

#### Short course annotation in English

The general objective of the course is to provide a one semester overview of modern biotechnology applications for medicine. During the course students will be introduced with methods and new developments of gene therapy, its application and perspectives. In addition student will be presented with methods for evaluation of gene expression, microarray technologies, interfering RNA application, stem cell technologies and perspectives. Special attention will be given to technologies of bone marrow transplantation artificial insemination and methods for prenatal diagnostics.

#### Prerequisites for entering the course

Cell biology, General genetics, Biochemistry, Molecular biology, Biophysics

#### Course aim

The aim of the course is to provide an interdisciplinary knowledge of scientific achievements, developing methodologies and perspectives in the field of biotechnology and its applications in medicine.

#### Links between course outcomes and criteria of learning achievement evaluation

Course outcomes	Criteria of learning achievement evaluation
To be able to explain main biotechnology for medicine terms, and to be able to associate them with various biotechnological and medical areas.	The main biotechnology for medicine terms described and associated with various biotechnology and medical areas.
To be able to describe gene therapy methods and perspective in medicine.	Ability to use acquired knowledge of gene therapy methods
To be able to describe stem cell technology and perspectives, bone marrow transplantation, artificial insemination	Ability to use acquired knowledge of stem cell technology and perspectives, bone marrow transplantation, artificial insemination
To be able to describe antibody engineering, genetic immunization	Ability to use acquired knowledge of antibody engineering, genetic immunization

To be able to understand biotechnological products manufacture methods and rational drug development principles	Ability to use acquired knowledge of biotechnological products manufacture methods and rational drug development principles
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### Content (topics)

1. Biotechnology in medicine and its relationship to other sciences. Congenital and acquired diseases and biotechnological approaches to their treatment.
2. Gene therapy methods. Viral vectors.
3. Non-viral vectors. Electroporation and sonoporation application for gene therapy.
4. Nervous system gene therapy. Cancer gene therapy.
5. Anti sensor development and its application in medicine. The usage of si-RNA and mi-RNA. Transgenic animal production and use in biomedicine.
6. Gene expression methods. Microarray technology and its application in medicine.
7. Modern microscopy and fluorescent in situ hybridization. FISH methodology. FISH adapting the methods of diagnosis, bio-markers decisions.
8. Regenerative medicine. Stem cells - therapy. Stem cell banks.
9. Bone marrow transplant types, present and prospects. Bone marrow transplantation in Lithuania. Stem cell populations after transplantation setting cutting-edge technology.
10. Gender causes of infertility. Artificial insemination. Artificial insemination techniques. Prenatal diagnostic methods. Prenatal genetic counseling essence and necessity.
11. Antibody Engineering. Genetic immunization.
12. Biotechnological methods of production antibiotics, vaccines and other medicinal substances.
13. Short repetitive sequences analysis methods application on chimerical analysis and the identification of individuals
14. Genetically modified organisms and plant use in biotechnology in medicine.
15. Recent biotechnology advances and their application prospects.

### **Practical work (contents):**

Plasmid with marked gene propagation; plasmid production, concentration, test of concentration and purity; gene transfer into cells in vitro using electroporation; gene expression efficiency; gene transfer into cells in vitro using sonoporation; transfection efficiency rating in vitro using the PCR method; identification and analysis of mutations; laboratory test response relation of the patient's clinic; individual identification; Family relationship identification, analysis and comparison

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

Lectures – 45 hours, laboratory work– 15 hours, examination – 3 hours, individual work – 97 hours.

### **Structure of cumulative score and value of its constituent parts**

Final assessment sums the assessments of written final examination (50%), written mid-term examination (30%) and assessment of laboratory works (20%).

### **Recommended reference materials**

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	Self-study rooms	Other libraries
<b>Basic materials</b>						
1.	2004	A. Thomson & J. McWhir. Gene targeting and embryonic stem cells	London ; New York [N.Y.] : Bios Scientific	1		
2.	2000	J. M. Walker and R. Rapley. Molecular	Cambridge : Royal Society	1		

		biology and biotechnology	of Chemistry			
3.	1998	M. Junker-Kenny and L. S. Cahill. The ethics of genetic engineering.	London : SCM Press ; Maryknoll (N.Y.) : Orbis Books	1		
4.	2011	A. Khan. Biotechnology Fundamentals	CRC Press			
5.	2000	S.N.Jogdand. Medical Biotechnology	Himalaya			

**Course programme designed by**

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