COURSE UNIT DESCRIPTION - BIOTECHNOLOGY

Course unit title		Code
BIOTECHNOLOGY		
L octuror(s)	Departm	ent(s)

 Lecturer(s)
 Department(s)

 Coordinator: Audrius GEGECKAS
 Vilnius University, Department of Microbiology and Biotechnology, M.K.Čiurlionio g. 21/27, LT-03101 Vilnius

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Cycle	Level of the course unit	Type of the course unit
Full-time studies (1 st stage)	1 out of 1	Compulsory

Mode of delivery	Period of delivered	Language(s) of instruction
Face-to-face	7 th semester, autumn	Lithuanian

Prerequisites a	nd corequisities
Prerequisites:	Corequisities (if any):
Biochemistry, cell or molecular biology, genetics	Microbiology, chemistry

Number of credits allocated to the course unit	Student's total workload	Contact ho	urs	Self-study and research hours
5	133	Lectures	48	53
		Laboratory training	32	

Purpose of the course unit: programme competences to be developed

Upon the successful completion of this course, students will acquire: *Subject-specific competences:*

- The modern life sciences research-based knowledge about biotechnological processes, their development and applications;
- skills to combine, integrate and apply knowledge in biology, chemistry, cell biology, genetics and biochemistry for analysis and development of biotechnological processes;
- skills to carry out basic biotechnological procedures, work with standard biotechnological and biomedical equipment; perform reliable measurements, document and analyse the results of the measurements;
- skills to select appropriate biotechnological methods for the investigation of biological molecules and biological processes; perform experiments, interpret the data obtained and draw science-based conclusions.

General competences:

- skills for self-development, skills to study biotechnology and general science recourses;
- skills to present in written and verbal forms the knowledge and concepts of biotechnology;
- skills to participate in the scientific discussion;
- skills to organize and plan work and time.

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Explains principles of biotechnological processes.	Problem-oriented teaching	Midterm exam, homework, results of
Analyses, compares and critically evaluates the	during lectures, analysis of	practical work, final exam
information related to this topic.	literature, laboratory	
	training.	
Explains principles of state-of-the-art methods	Problem-oriented teaching	Midterm exam, homework, results of
used for development of biotechnological	during lectures, analysis of	practical work, final exam
processes.	literature, laboratory	
	training.	
Demonstrates the ability to integrate knowledge	Problem-oriented teaching	Midterm exam, homework, results of
from other related disciplines, such as	during lectures, analysis of	practical work, final exam
biochemistry, genetics, molecular biology, cell	literature, laboratory	

biology	microbic	ology	chemistry
biology,	meroore	nogy,	enemistry.

training.

				Cont	tact h	ours	Self-study work: time and			
	Content: breakdown of the topics	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work	Contact hours	Self-study hours	Assignments
1.	Introduction to biotechnological processes. Conception of the biotechnology, main concepts, trends and development.	3						3	1	Analysis of scientific and methodological literature. The discussion at the lectures.
2.	Construction and development of the microorganism for production of target product; problems and possible solutions.	6						6	1	Analysis of scientific and methodological literature. The discussion at the lectures. Preparation for laboratory works, learning at the practice works.
3.	Gene engineering. Vectors, diversity of the bacterial and yeast strains, applications possibilities. DNA transfer into cells.	4						4	1	Analysis of scientific and methodological literature. The discussion at the lectures. Preparation for laboratory works, learning at the practice works.
4.	The basics of gene expression. Expression and optimization of the target product, process monitoring.	3						3	1	Analysis of scientific and methodological literature. The discussion at the lectures. Preparation for laboratory works, learning at the practice works.
5.	Cell disruption methods. Protein purification. Development and optimization of a purification strategy.	4						4	8	Analysis of scientific and methodological literature. The discussion at the lectures. Preparation for laboratory works, learning at the practice works. Preparation for I intermediate achievement test.
6.	The growth of the microorganisms – exponential and stationary phases biochemistry.	2						2	1	Analysis of scientific and methodological literature. The discussion at the lectures.
7.	The basics of biotechnological process. Types	3						3	1	Analysis of scientific

	of fermenters: properties and application.								and methodological
									literature. The
									discussion at the
									lectures.
8	Industrial biotechnology Use of enzymes in	4					 4	1	Analysis of scientific
•••	hiotechnology new enzyme search and						•	-	and methodological
	application prospect								literature The
	application prospect.								discussion at the
									lastures Propagation
									for laboratory works
									for laboratory works,
									works.
9.	The basics of protein engineering. Protein	4					4	1	Analysis of scientific
	engineering and development of new products								and methodological
									literature. The
									discussion at the
									lectures.
10	Abzymes: modelling engineering and	4					 4	1	Analysis of scientific
10.	manufacturing of antibody with catalytic	-					-	-	and methodological
	activity								literature The
	activity.								discussion at the
11	D. 11. (2					 2	0	A set a factor of the factor o
11.	Red biotechnology. New drug development.	3					3	ð	Analysis of scientific
	Gene therapy.								and methodological
									literature. The
									discussion at the
									lectures. Preparation
									for II intermediate
									achievement test.
12.	Nanobiotechnology. Nanoparticles.	4					4	1	Analysis of scientific
	Nanotechnology based by biological objects and								and methodological
	their uses in biotechnology.								literature. The
									discussion at the
									lectures.
13.	Systems and synthetic biology.	4					4	10	Analysis of scientific
									and methodological
									literature. The
									discussion at the
									lectures. Preparation
									for exam.
La	boratory training		1	1	1				
1.5	creening of organisms producing the target					8	8	1	Self-directed learning
enz	zyme. Identification of proteins by mass							_	of the topic-related t
spe	ctrometry								material laboratory
spe	out officer y								training
2 (Gene expression systems Application of					8	8	1	Self-directed learning
for	menter for process optimization					0	0	1	of the topic related
	menter for process optimization.								material laboratory
									training
2 1	solution of socrated naminlasmin and tatal		-	-		4	4	1	Salf directed learning
5.1	toing					4	4	1	of the topic related
pro	dems.								of the topic-related
									material, laboratory
						0	0	1	training
4.	Protein purification by affinity chromatography					8	8	1	Self-directed learning
and	gel-filtration.								of the topic-related
									material, laboratory
									training
5.	Analysis of protein purification procedure:					4	4	1	Self-directed learning

evaluation of yield, quality and quantity of the target protein.						of the topic-related material, laboratory training
6. Preparation for presentation of results of practical work.					12	Preparation for presentation of results of practical work.
Total	48		32	80	53	

Assessment strategy	Weight,%	Assessment period	Assessment criteria
Midterm exam (topics 1-6)	25	1 st to 7 th week of the course	 Midterm exam (written) consists of two problem-oriented elective or open type questions; correct answers are assessed in max. 2.5 points. Assessment criteria: 2.5: answers are prepared and presented excellent or very well;
			 comments are presented. 1.25: answers are prepared and presented moderately; comments are presented not appropriately. 0: answers are not prepared and presented.
Homework	25	15 th week of the course	 Homework (written) consists of one problem-oriented elective or open type question. During assessment is considered: quality of analysis of used scientific publications; answers to question and discussion, presentation of ideas. Assessment criteria: 2.5: a material of the homework was prepared and presented excellent or very well; problems were raised, comments and ideas were presented. 1.25: a material of the homework was prepared and presented moderately; problems were raised, but there ware moderate comments. 0: a material of the homework was not prepared.
Laboratory training	10	1 st to 15 th week of the course	 During assessment is considered: quality of practical work, analysis of obtained results; answers to question and discussion. Assessment criteria: the results were fully achieved and presented excellent or very well. 0.5: the main results were achieved and presented moderately. The laboratory work was not prepared.
Exam	40	16 th week of the course	 Final exam (written) is allowed only after positive assessment of the midterm exam, homework and results of the practical work. Task of the exam consists of two problem-oriented elective or open type questions; correct answers are assessed in max. 4 points. Assessment criteria: 4: answers are prepared and presented excellent or very well; comments are presented. 2: answers are prepared and presented moderately; comments are presented not appropriately. 0: answers are not prepared and presented.
Total	100		The final grade is based on an overall assessment of midterm exam, homework, results of practical work, and written final exam.

Author	Year of publica- tion	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link	
Compulsory reading		•			
Eds. C. Ratledge, B.	2006	Basic Biotechnology.		Cambridge University Press.	
Kristiansen.					
E. Smith.	2009	Biotechnology (5th edition).		Cambridge University Press.	

Optional reading				
Gary Walsh.	2007	Pharmaceutical		John Wiley & Sons Ltd.
-		Biotechnology. Concepts and		-
		Applications.		
		Nature Biotechnology, Trends		http://www.sciencedirect.com
		in Biotechnology, Curr.		http://onlinelibrary.wiley.com
		Opinion. Biotechnol. and		PubMed.gov
		other		