

Course code	Course group	Volume in ECTS credits	Course hours
BIO 3020		3	80

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

Course title in Lithuanian

Pramoninė biotechnologija

Course title in English

INDUSTRIAL BIOTECHNOLOGY

Short course annotation in Lithuanian

Šio kurso tikslas – suteikti žinių apie pramonėje taikomas baltąją ir žaliąją biotechnologijas; supažindinti su pagrindiniais biotechnologijos taikymo principais; praktinių biotechnologijų taikymu pramonėje ir jų ateities perspektyvomis. Vienas iš kurso tikslų – suteikti bazines žinias apie ekonomišką biotechnologijų panaudojimą pramonėje; pramoninių biotechnologijų potencialą ir šių technologijų taikymą limituojančius veiksnius; gebą įvertinti panašumus bei skirtumus tarp klasikinės pramonės ir pramonės, kurioje taikomos biotechnologijos; gebėti adekvačiai įvertinti problemas, kylančias taikant biotechnologijas pramonėje bei rasti optimaliausius problemos sprendimo būdus. Išklaušę kursą studentai gebės suprasti pagrindinius dalyko principus ir praktiškai taikyti įgytą patirtį, sprendžiant problemas bei turės platų požiūrį apie besivystančios šiuolaikinės pramonės scenarijų.

Short course annotation in English

This course aims to provide knowledge of the industrial biotechnologies, namely “white” and “green” technologies; to introduce the principles of the subject, their application into common industrial practice and their future trends. It also aims to provide basic understanding of economical driving forces and the potential and limitations of these technologies; a capability to evaluate relations and differences between classical industrial approach and biotechnological one, to evaluate and select the most appropriate solution for a given practical problem in this area. After completion of the course students will demonstrate understanding and have practical experience in approaching theoretical problems and show wide vision onto the evolving modern industrial scenario.

Prerequisites for entering the course

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Course aim

The aim of the course is to provide an introduction to “white” and “green” biotechnologies, their theoretical principles and application to make products or enhancing processes and to give a wide view onto the evolution of modern industry and its trends to an environmental friendly productive system.

Links between course outcomes and criteria of learning achievement evaluation

Course outcomes	Criteria of learning achievement evaluation
Understand integrative parts of the biotechnological approach	Presents the basic principles of industrial biotechnology, content and importance of all the issues involved
To show capability in evaluating the industrial target and how to achieve it	Presents systemic evaluation of raw materials, process conditions and equipment, and provides the importance how their choice affect the production
Understand principles of the industrial plant and process utilization and development	Presents principles of the fermentation methods, schemes of the equipment, provides range of applicability, operations, controls and requirements, methods for development and scale up

Implement the theoretical knowledge working with the microbiological processes	Presents practical skills of handling of the main methods for utilization and preservation of microbial strains in sterile conditions, using the equipment
Manage the results obtained and present conclusions	Can process the results mathematically, evaluate statistically, draw conclusions based on the results obtained

Content (topics)

1. Biotechnology and industrial biotechnology. Introduction to the subject, general definitions and history.
2. Fermentation technology principles: microbiological aspects and process.
3. Fermentation technology: sterilization, culture preservation and fermentation media.
4. Fermentation technology: bioreactors, operation, instrumentation and process control.
5. Solid State Fermentation: principles, differences and utilization.
6. Plant and process development and scale up.
7. Process modeling, energy and resources saving.
8. Enzymes in biotechnology and industry.
9. Biotechnology potential of agro-industrial residues for bioprocess.
10. Bioconversion of agro-industrial residues and their uses in industrial biotechnology and biomass utilization.
11. Products in biotechnology for agricultural and environmental applications.
12. Bioenergy and biofuels.
13. Products in biotechnology for food, health care, medical and other industrial and technical applications.
14. Sustainability, process analysis and life cycle assessment.
15. Ethical issues, intellectual property and patenting.

Practical work (contents):

Case studies, Sterilization process, Microbial growth and preservation, Selection and preparation of media, Liquid fermentation, Solid State Fermentation, Enzymes applications.

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

Lectures – 30 hours, laboratory work – 15 hours, individual work – 28 hours, examinations– 7 hours. Total 80 h.

Structure of cumulative score and value of its constituent parts

Final assessment sums the assessments of written final examination (50%), written mid-term examination (17%) and assessment of laboratory works (33%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	Self-study rooms	Other libraries
Basic materials						
1.	2000	Molecular biology and biotechnology / edited by John M. Walker and Ralph Rapley.	Cambridge : Royal Society of Chemistry, VDU Informat./Gamtos m. b-kos abonementas (D44927-4L)			
2.	2010	Functions and biotechnology of plant secondary metabolites / edited by Michael Wink.	Ames Iowa: Wiley-Blackwell Išdavimo vieta VDU			

			Informat./Gamtos m. b-kos abonementas (D41171)			
3.	2004	Biotechnology and the future of society : challenges and opportunities.	Abu Dhabi : Emirates Center for Strategic Studies and Research VDU Centrinis abonementas (D61712)			
<i>Supplementary materials</i>						
1.	2005	Straathof A.J.J. Adlercreutz P., Applied biocatalysis (2th ed.).	Harwood academic publishers			
2.	1996	Hunter-Cevera J.C., Belt A., Maintaining cultures for biotechnology and industry	Academic Press			
3.	2008	Pandey A., Soccol C.R., Larocche C., Current development in Solid-State Fermentation	Asiatech Publishers, inc.			

Course programme designed by

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