COURSE UNIT DESCRIPTION

Course Unit Title	Code
WORKSHOP: BIOTECHNOLOGY	

Lecturer(s)	Department(s)
Coordinator: prof. dr. Rolandas Meškys Other(s): j. assit. Augustė Dementavičienė	Institute of International Relations and Political Science, Vilnius university, Vokiečių str. 10, LT-01130, Vilnius, tel. +370 52514130, e-mail: tspmi@tspmi.vu.lt

Study cycle	Type of the course unit
First	Elective

Mode of delivery	Course unit delivery period	Language (s) of instruction
Face-to-face	5 (autumn) semester	English

Requirements for students	
Pre-requisites: -	**Co-requisites (if any): -**

Number of credits allocated	Total student's workload	Contact hours	Self-study hours
5	130	32	98

Purpose of the course unit: programme competences to be developed		
Aim of this course is to acquaint a students with aspects of ethical, legal and other issues related to biotechnologies; to develop their understanding of intersection of biology and technology that serves many purposes including: gene therapies, drug therapies, biologics and biofuel development, as well as scientific principles that apply to the numerous biotechnology sectors; to discuss and evaluate scientific progress in biotechnological sphere.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
Students will be able to understand the basic biological principles that are an integral part of modern-day scientific research.	Problem-oriented lectures, seminars (text analysis, comparative assessment and systemic analysis of practical issues, case study, oral presentations on assigned topics, group discussions), practical assignments in the laboratory, individual studies (individual search of information, critical literature studies and the analysis of theoretical and practical problems)	Participation in seminars, laboratory practice, examination
Students will understand and be able explicate the meaning and context of such concepts as gene, genetic engineering, proteomics, synthetical biology and others.		
Students will be able to identify and define the key techniques used by biotechnologists, as well as to apply several of them in practice in order to gain better understanding of realm of natural sciences.		
Students will be able to explain and apply the key regulatory, ethical and practical considerations for biotechnological entities,	Problem-oriented lectures, seminars (text analysis, comparative assessment and	Participation in seminars, examination

analyse related hypothetical situations based on current research data.	systemic analysis of practical issues, case study, oral presentations on assigned topics, group discussions), individual studies (individual search of information, critical literature studies and the analysis of theoretical and practical problems)	
Students will be able to explain the contemporary challenges of managing scientific biotechnological development in the increasingly globalized world.		
Students will be able to take critical approach regarding scientific biotechnological development, explain their perspective in in clear, coherent, argumentative and logical manner as well as to collaborate with professionals working in the field of biotechnology.		
Students will be able to conduct a scientifically sound analysis of scientific biotechnological development and provide policy recommendations regarding how to address the key ethical and practical challenges.		

Content: breakdown of the topics	**Contact hours**							**Self-study: hours and assignments**	
	Lectures	Consultations	Seminars	Practical sessions	Laboratory activities	Internship/work	**Contact hours**	**Self-study hours**	**Assignments**
1. What is biotechnology? Red, white, blue, green and other colors of biotechnology	2						**2**		
2. Basics of cells and cell Division/DNA/ Model Organisms and growing cells. Types of cells Cell division Model organisms Growing cells in the lab			2				**2**	**6**	Discussion about the control of the biotechnological way of solving problems: Funke, Odelia. "Biopolitics and public policy: Controlling biotechnology." *PS: Political Science & Politics* 18.1 (1985): 69-77.
3. Intro to DNA A little DNA history Structure of DNA DNA replication DNA damage and mutation Working with DNA	2						**2**	**6**	Group of the student presents the main questions of the topic (questions that came from the non-scientist world view and also from the scientific realm).
4. The Human Genome Project Modern day DNA sequencing			2				**2**	**6**	Discussion in groups based on the article: Collins, Francis S., Michael Morgan, and Aristides Patrinos. "The Human Genome Project: lessons from large-scale biology." *Science* 300.5617 (2003): 286-290.
5. Gene expression: tools, tricks, and relevance to biological research	2						**2**	**3**	Group of the student presents the main questions of the topic

Gene regulation RNA Reverse Transcriptase Protein biosynthesis									(questions that came from the non-scientist world view and also from the scientific realm).
6. Genetic engineering: how, why, past, present and future Noncoding DNA From DNA to RNA to protein Genetic engineering			2				**2**	**6**	Laboratory work: learning the basic methods and understanding the way biotechnological science works
7. Genome sequencing and personalized medicine Therapeutic approaches Biomarkers Epigenetics Transgenic mice CRISPR/Cas9 system			2				**2**	**6**	Understanding how concrete methods are relevant for political economy: Herring, Ronald, and Robert Paarlberg. "The political economy of biotechnology." *Annual Review of Resource Economics* 8 (2016): 397-416.
8. Proteins and the proteomics Basics on proteins Genetic defects to protein malfunction Detecting of proteins Proteomics Other -omics Systems Biology			4				**4**	**6**	Laboratory work: conducting small experiments under guidance of the professor.
9. Ethical, legal issues			2				**2**	**6**	Discussion about the legal and ethical issues that were practically done in the laboratory assignments: Fu, Yeung Lap. "A Study on Medical Biotechnology System from Legal Perspective." *Journal of Commercial Biotechnology* 23.4 (2017)
10. Biocatalysts Green chemistry Bioconversion Protein engineering Evolution *in vitro*	2						**2**	**3**	Group of the student presents the main questions of the topic (questions that came from the non-scientist world view and also from the scientific realm).
11. Bacteria: friends and foes Pathogens Antibiotics Microbiome			4				**4**	**6**	Laboratory work: conducting small experiments under guidance of the professor.
12. Drug discovery and development Drug pipeline Target identification Small molecule screens RNAi Therapeutic proteins and antibodies Vaccines Preclinical/ Clinical phases			2				**2**	**6**	Discussion based on: Müller-Kuhrt, Lutz. "Putting nature back into drug discovery." *Nature biotechnology* 21.6 (2003): 602-602.
13.Stem cells and regenerative medicine	2						**2**	**6**	Group of the student presents the main questions of the topic

iPSC Organoids									(questions that came from the non-scientist world view and also from the scientific realm).
14. Synthetic biology Future of biotechnology			2				**2**	**6**	Discussion about the future of biotechnology from various perspectives: Herring, Ronald J., ed. *Transgenics and the poor: Biotechnology in development studies*. Routledge, 2013.
Final exam								**26**	Preparation for the final exam.
Total	**10**		**22**				**32**	**98**	

Assessment strategy	Weight, percentage	Assessment period	Assessment criteria
Participation in seminars	30	During semester	3 points – actively participates in seminars, contributes to discussion and textual analysis, engages with other participants, critically evaluates arguments and theories, raises constructive questions, offers creative solutions to the raised problems; 2 points –participates in seminars, occasionally contributes to discussion, formulates questions, offers opinion, engages with other participants; 1 point – partly participates in seminars, raises questions of general nature, rarely contributes to discussion or does it with some mistakes or in imprecise manner; 0 points – does not or hardly ever participates in discussions during seminar, formulating of questions and solutions, does not answer questions or provides answers with major mistakes or misses more than 30% of seminars;
Practical work in the lab	40	During semester	4 points – actively participates, asks a lot of questions, successfully manages to conduct the assignment in the laboratory, understands the main principles of lab work and applies them correctly. 3 points – participates and asks some questions, manages to conduct the assignment in the laboratory with a few minor mistakes, understands the main principles of lab work and manages to apply them with a few minor mistakes. 2 points – partly understands the main principles of lab work, applies them with several mistakes, passively participates. 1 point – partly understands the main principles of lab work, applies them with numerous serious mistakes, provides unstructured reasoning, does not seek advice, fails to conduct the practical assignment. 0 points – does not participate.
Examination	30	At the end of the course	Open book questions: solving the problems of current issues using the theoretical and practical knowledge. 3 points – a detailed and comprehensive answer to questions, correctly identifies and contextualizes the problems relating to the topic, conception or theory, examines and critically evaluates its arguments and ideas. 2 points – partly answers to questions, partly understands the problems relating to the topic, conception or theory, examines its arguments and ideas. 1 point – partly understands the problem relating to the topic, conception or theory, offers unstructured reasoning. 0 points – does not complete the examination.

Author	Year of publication	Title	Issue of periodical or volume of publication	Publishing place and house or web link
Compulsory reading				
Indu Ravi, Mamta Baunthiyal Jyoti Saxena (Ed.)	2014	Advances in Biotechnology		Springer New Delhi Heidelberg New York Dordrecht London
Funke, Odelia	1985	Biopolitics and public policy: Controlling biotechnology	PS: Political Science & Politics 18.1	
Herring, Ronald, and Robert Paarlberg	2016	The political economy of biotechnology	Annual Review of Resource Economics 8	
Collins, Francis S., Michael Morgan, and Aristides Patrinos	2003	The Human Genome Project: lessons from large-scale biology	Science 300.5617	
Herring, Ronald J. (ed.)	2013	Transgenics and the poor: Biotechnology in development studies.		Routledge
Fu, Yeung Lap	2017	A Study on Medical Biotechnology System from Legal Perspective	Journal of Commercial Biotechnology 23.4	
Müller-Kuhrt, Lutz	2003	Putting nature back into drug discovery	Nature biotechnology 21.6	
Recommended reading				
Thieman, William	2019	Introduction to Biotechnology	Global Edition, 4th edition	Pearson
Stokes, Donald E.	1997	Pasteur's Quadrant: Basic Science and Technological Innovation	Chapter 1	Washington, DC: Brookings Institution Press
Stevens, Hallam	2016	Biotechnology and Society An Introduction		University of Chicago Press