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Bioeconomy development and policy
SYLLABUS

Study subject No: **1.1.**

Responsible Unit: **Latvia University of Life Sciences and Technologies (LBTU)**

Credits and distribution of academic hours*:

	Credits ECTS	Contact hours		Independent study hours	Total hours
		Lectures	Practical works or seminars		
VMU	6	30	24	146	210
LBTU	2	10	8	42	30
Total	**8**	**40**	**32**	**168**	**240**

** 1 ECTS = 30 hours (9 contact hours and 21 independent hours);*
1 academic hour = 40 minutes;
Theoretical lectures not less than 50% of contact hours.

Course developers:
Latvia University of Life Sciences and Technologies (LBTU), **Irina Pilvere, Prof., PhD**
Latvia University of Life Sciences and Technologies (LBTU), **Liga Proskina, Assoc. prof., PhD**
Vytautas Magnus University, Lithuania (VMU), **Vlada Vitunskiene, Prof., PhD**

Notes: General study course for the master programme Bioeconomy.

Prior knowledge: Basic of economics.

Annotation: The course provides students with knowledge, develops professional and general skills in identifying the newest trends in the development of bioeconomies at the global, European and Asian and national scales. The course deals with renewable biological resources production industries – agriculture, forestry, fisheries –, as well as bio-based manufacturing and other industries that converts of these resources and bio-waste streams into value added products, exploit biotechnologies, thereby sustainable consuming and producing natural, quality, and innovative bioproducts.

The aim: *is to enable students to acquire the modern knowledge on bioeconomy and to develop skills to critically evaluate the performance, impact and development of bioeconomy in terms of sustainability as well as to creatively solve economic or managerial problems related to bioeconomy or separate bioeconomy sectors.*

Learning outcomes (knowledge, skills and competences)

Learning outcomes	**Assessment methods**	**Levels of achievement**		
		Satisfactory	**Average**	**High**
KNOWLEDGE				
Students will be able demonstrate the knowledge of bioeconomy principles, the main global, regional,	Testing/ written survey, assessment of	40-59 % of the questions are answered and math	60-79 % of the questions are answered and math	80-100 % of the questions are answered and

national and/or local drivers of bioeconomy development, the main bioeconomy sectors. Understand the basic principles of circularity of bioeconomy, explain the cascading principles and their application in bio-economy; to describe the benefits of cascading use of biomass.	case studies of students, observation of discussions	problems are solved correctly. Basic understanding of the main drivers of bioeconomy development and circularity	problems are solved correctly. Understanding of bioeconomy development principles and drivers of bioeconomy development in different levels and the basics of circularity and cascading principles and their application in bioeconomy.	math problems are solved correctly. In-depth understanding of the basic principles for development of bioeconomy related sectors, circularity, cascading principles, their application and benefits in bioeconomy
To define biological resources and bio-waste, classify them according to various criteria; analyse biological resources potential and to find out differences of its types, to reveal the main constraints of biological resources potential; to describe externalities of production of bio-resources.	Testing/ written survey, assessment of case studies of students, observation of discussions	40-59 % of the questions are answered and math problems are solved correctly.	60-79 % of the questions are answered and math problems are solved correctly.	80-100 % of the questions are answered and math problems are solved correctly.
Understand the basic principles of the biomass supply chain and value chain, they structure and the main features; to reveal differences between the two chains.	Written survey, assessment of case studies of students, observation of discussions	Knowledge of the main differences of the biomass supply chain and value chain. Student does not explain some of his decisions.	Knowledge and understanding of the biomass supply chain and value chain. Student can explain his decisions	Comprehensive knowledge and understanding of the main differences of the biomass supply chain and value chain. Student has ability to critically assess taken decisions.
Demonstrate the knowledge of key policies related to bioeconomy, the role of science and innovation in the sustainable development of the circular bioeconomy, explain and critically evaluate its objectives; to outline the key strategic objectives and actions leading the way towards a	Assessment of case studies of students, observation of discussions	Awareness of the basic policy principles for developing a framework of bioeconomy sectors.	Knowledge of the key policies, strategic objectives and actions leading the way towards a sustainable, circular bioeconomy.	Close familiarity with key policies related to bioeconomy, explain and critically evaluate its objectives; outline the key strategic objectives and actions leading

sustainable, circular bioeconomy in Uzbekistan.				the way towards a sustainable.
To list and explain indicators suitable for assessing the performance and impact of bioeconomy in terms of sustain-ability; to gather information and analyse it, to apply methods relevant to information nature; to draw valid conclusions, identify economic, ecological and social problems in bioeconomy development as well as to find creative solutions to them; to prepare a teamwork, to present it to the audience and participate in debates	Assessment of teamwork of students, observation of debates and discussions	Knowledge of the key principles of bioeconomy sectors performance assessment methods and indicators. solutions to economic, ecological and social problems in bioeconomy development, difficulty in arguing the opinion.	Knowledge and understanding of bioeconomy sectors performance assessment methods and indicators. solutions to economic, ecological and social problems in bioeconomy development, argumentation is based on basic knowledge and there is difficulty in identifying relevant regularities	Ability to critically assess the indicators suitable for assessing the performance and impact of bioeconomy in terms of sustain-ability, convincingly and reasonably present the results based on their own assessments, an analysis of relevant information and the regularities identified
SKILLS				
Professional skills				
Independently analyse and compare endogenous and exogenous factors affecting the development of bioeconomy sector industries and rural areas as well as assess the sustainable use thereof.	Assessment of teamwork of students , a case study.	Some ability to differentiate factors affecting the development of the bioeconomy sector, analyse and compare them.	Ability to understand requirements for independently analyse factors affecting the development of bioeconomy sector industries and rural areas.	Ability to accurately formulate and analyse different factors affecting the development of bioeconomy sectors
Identify the principles of and criteria for selection of a proper biotechnology method for the sustainable use of bioresources in producing products; explain and critically evaluate its objectives; to outline the key strategic objectives and actions leading the way towards a sustainable development of circular bioeconomy at regional, national and/or local levels.	a presentation of teamwork of students	Basic ability to select and use biotechnology methods for the sustainable use of bioresources.	Has good ability to select methods for the sustainable use of bioresources, yet there is difficulty in interpreting and explain strategic objectives and actions.	Excellent ability to completely describe and assess the proper biotechnology method for the sustainable use of bioresources, explain and critically evaluate the differences, problems, contradictions.
Using their knowledge and understanding on economic growth opportunities, in analysing the development	Assessment of teamwork of students	Some ability to integrate knowledge and come up with solutions to	Good ability to integrate knowledge, which allows identifying	Ability demonstrates an original, practical and integrated

of bioeconomic industries, in taking advantage of deeper, complete, and efficient processing of products that raise their value added, and in tackling the problems of integrating theory and practice.		developing a knowledge management system	necessary changes and select strategies and technological tools for implementing the changes	perspective on the development of a knowledge management system
Soft skills				
Responsibly plan the completion of the assignments given	Independent work. Assessment of teamwork of students	Difficulty in planning their own time and meeting deadlines	Deadlines are met, yet the work is done superficially and inaccurately	Deadlines are met, the work is done accurately
Develop communication skills relevant to the profession, effectively work in a team	Teamwork, practical assignments, discussion.	Difficulty in engaging in teamwork and expressing and arguing their own thoughts	Some ability to engage in teamwork and express and argue their own thoughts	Excellent ability to engage in teamwork and express and argue their own thoughts
COMPETENCE				
Cooperate and develop their own conclusions and proposals on the effects of agricultural and environmental policies on the bioeconomic sector and rural development as well as methodologically correctly manage and analyse economic processes in bioeconomy sector industries and rural development.	Examination (Testing/ written survey)	40-69% of the questions are answered correctly	70-89% of the questions are answered correctly	90-100% of the questions are answered correctly
Integrate bioeconomic findings into the current paradigm and use them to create original solutions.	Examination (Testing/ written survey)	40-69% of the questions are answered correctly	70-89% of the questions are answered correctly	90-100% of the questions are answered correctly

Requirements for awarding credit points:

In the theoretical classes of the course, students learn sustainable development principles for development of bioeconomy; the concepts of bioeconomy and its composition, circularity and sustainability; objectives and principles of bioeconomy policy and bioeconomy related policies and their significance in promoting sustainable development of bioeconomy and rural economic as well; the concepts of biological resources potential and the sustainability assumptions of this potential in the context of economic, social and ecological constraints; the concepts of biological resources supply chains and value chains;

In practical classes, students learning by the case study method identifies problems consisting in a real situation or analyses examples of good practice of sustainable development of circular bioeconomy.

In the teamwork, students analyze the performance or impact of bioeconomy in terms of sustainability; identify economic, ecological and social problems of bioeconomy development and find creative solutions to them. The results acquired are summarized and presented. The course ends with an examination.

Description of the organization and tasks of students' independent works

1. Students get acquainted with and study the literature on changes in bioeconomy and bioeconomy related policies, as well as on the possibilities of more complete and efficient use of bioresources in the bioeconomy.
2. During the course, an analysis of economic development indicators of the bioeconomy industries and rural areas and the factors influencing the economic development is done independently. The results of the case study are presented in practicals.
3. Students acquire information and build up an understanding of the discussion topics of the bioeconomy for practicals.

Knowledge assessment and prerequisites for taking a test or examination (Criteria for Evaluating Learning Outcomes)

The final mark consists of the following pieces of assessment: an examination 45%; a case study of the bioeconomy sectors and its oral presentation, student's activity in discussions 20%; Teamwork of students on sustainability assessment of bioeconomy sectors or sub-sectors and its oral presentation, student's activity in discussions 35%.

** 10 percent are equal to one point on a 10-point marking scale (or 10 percent are equal to 0.5 point on a 5-point marking scale).*

Topic	Type of assessment	Percen-tage	Assessment deadline
The case study of the bioeconomy sectors and its oral presentation, student's activity in discussions	Assessment of case study, observation of debates and discussions	20	During the entire semester
Teamwork of students and its oral presentation of the teamwork of students, student's activity in discussions	Assessment of Teamwork of students	35	Within the specified time for the submission of teamwork and its oral presentation
Exam		45	Within the specified time for the exam
Total		100	-

The course contents

1. Lectures

1. Introduction: challenges and importance of bioeconomy for sustainable development.
   Bioeconomy contribution in achieving United Nations' Sustainable Development Goals, the sustainable development definition and concept.
2. Concepts of bioeconomy: bioeconomy definition, composition, circularity and sustainability.
3. Bioeconomy policies around the World: case studies about the Bioeconomy Strategies and related policies in different world regions and countries.
4. Potential of biological resources: types and classifications of biological resources, the primary production of biological resources and generation of biological waste.
5. Biological resources supply chains and value chains: a short and the long supply chains and their main segments; value creation in the chain, value-added chain.
6. Knowledge, research and innovations in the bioeconomy: different models of regional / national innovation ecosystems and bio economy relate research and innovation policies.
7. Assessment of the bioeconomy or its sectors based on sustainability approach: methodological framework for assessing the performance and impact of bioeconomy in terms of economic, ecological and social sustainability.

2. Practicals / seminars

1. Case studies of the bioeconomy or its sectors contribution to achieving United Nations' Sustainable Development Goals in Uzbekistan (3-5 cases).
2. Case studies of contemporary global or regional (European or Asian) drivers of bioeconomy development and its interpretation in the national context of Uzbekistan (3-5 cases).
3. Case studies of good practices of development of bioeconomy and its sectors in Uzbekistan (3-5 cases).
4. Case studies of good practices of circular bioeconomy in the World and Uzbekistan (3-5 cases).
5. Case studies of good practices of development biological resources supply chains and value chains in Uzbekistan (3-5 cases).
6. Case studies of bioeconomy related policies of Uzbekistan and their significance in promoting sustainable development of bioeconomy. (3-5 cases).
7. Case studies of knowledge, research and innovations ecosystem development in Uzbekistan (3-5 cases).
8. Sustainability assessment methodology for bioeconomy: aim, tasks and structure of teamwork of students; designing a methodological framework for analysis performance or impact of bioeconomy in terms of economic, ecological and social sustainability; appropriate methods and data sources for assessment.

List of sources of training, methodological and scientific literature and information

Compulsory reading (books, scientific articles, online sources etc.):

1. Bioeconomy: Shaping the Transition to a Sustainable, Biobased Economy. (2018) Editor Iris Lewandowski. Springer International Publishing AG (Chapter 3-7, 10-11) https://link.springer.com/content/pdf/10.1007%2F978-3-319-68152-8.pdf
2. FAO. (2021). Aspirational principles and criteria for a sustainable bioeconomy. Rome www.fao.org/3/cb3706en/cb3706en.pdf
3. Kircher, M., Bott, M., & Marienhagen, J. (2020). The Importance of Biotechnology for the Bioeconomy. In Bioeconomy for Beginners (pp. 105-128). Springer, Berlin, Heidelberg. https://link.springer.com/chapter/10.1007/978-3-662-60390-1_5

4. Stegmann, P., Londo, M., & Junginger, M. (2020). The circular bioeconomy: Its elements and role in European bioeconomy clusters. Resources, Conservation & Recycling: X, 6, 100029. https://www.researchgate.net/publication/338563080_The_Circular_Bioeconomy_Its_elements_and_role_in_European_bioeconomy_clusters
5. IACGB (2020) Global Bioeconomy Policy Report (IV): A decade of bioeconomy policy development around the world. A report from the International Advisory Council on Global Bioeconomy. https://gbs2020.net/wp-content/uploads/2020/11/GBS-2020_Global-Bioeconomy-Policy-Report_IV_web.pdf
6. Kershaw, E. H., Hartley, S., McLeod, C., & Polson, P. (2020). The Sustainable Path to a Circular Bioeconomy. Trends in Biotechnology. https://www.sciencedirect.com/science/article/pii/S0167779920302924

Further reading:

1. Heimann, T. (2019). Bioeconomy and SDGs: Does the bioeconomy support the achievement of the SDGs?. Earth's Future, 7(1), 43-57.
2. European Commission. (2018). A sustainable Bioeconomy for Europe: Strengthening the connection between economy, society and the environment. COM(2018) 673 final. Brussels, 11.10.2018 https://www.kowi.de/Portaldata/2/Resources/horizon2020/coop/bioeconomy-strategy-2018.pdf
3. Kardung, M., Cingiz, K., Costenoble, et al. (2021). Development of the Circular Bioeconomy: Drivers and Indicators. Sustainability, 13(1), 413.
4. Gatto, F., & Re, I. (2021). Circular Bioeconomy Business Models to Overcome the Valley of Death. A Systematic Statistical Analysis of Studies and Projects in Emerging Bio-Based Technologies and Trends Linked to the SME Instrument Support. Sustainability, 13(4), 1899.
5. Kuosmanen, T., Kuosmanen, N., El-Meligli, A., Ronzon, T., Gurria, P., Iost, S., M'Barek, R., (2020). How Big is the Bioeconomy? Reflections from an economic perspective. EUR 30167 EN, Publications Office of the European Union, Luxembourg,
6. Going climate-neutral by 2050. A strategic long-term vision for a prosperous, modern, competitive and climate-neutral EU economy. (2019). Luxembourg: Publications Office of the European Union.
7. Ronzon, T., Lusser, M., Klinkenberg, et al. (2017) Bioeconomy Report 2016, JRC Science for Policy Report. EUR 28468 EN; Publications Office of the European Union: Luxembourg.
8. FAO. (2016). How sustainability is addressed in official bioeconomy strategies at international, national and regional levels. An overview., Rome

Periodicals and other sources:

1. Guobys L. 2018, Setting the Scene: Bioeconomy" 25 April, 2018 CASA-SCAR National Meeting in Hungary Ministry of Agriculture, Budapest https://scar-europe.org/images/SCAR_EVENTS/Hungary_25-04-2018/presentations/1-GUOBYS_EC_Bioeconomy.pdf
2. Gomez San Juan, M., Bogdanski, A. & Dubois, O. 2019. Towards sustainable bioeconomy - Lessons learned from case studies. Rome, FAO.

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