

Circular economy SYLLABUS

Study subject No: 3.1.

Responsible Unit: JAMK University of Applied Sciences,
School of Technology, Institute of Bioeconomy (JAMK)

Credits and distribution of academic hours*:

	Credits ECTS	Contact hours (total 63)		Independent study hours	Total hours
		Lectures (academic hours)	Practical works or seminars		
JAMK	7	38	25	147	210
Total	7	38	25	147	210

* 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:

JAMK University of Applied Sciences **Knuuttila Kirsi, M.Sc.**

JAMK University of Applied Sciences **Hakkarainen Mari, Senior lecturer**

Notes: General study course for the master programme Bioeconomy.

Prior knowledge: Bases of operational environment in Uzbekistan, Bioproduct and biobased value chains

Annotation: This course provides the students the basic knowledge about circular economy as phenomenon as well as circular economy relation to bioeconomy. The students understand the global challenges and megatrends as well as learn to know how bioeconomy is related to UN development goals. The course develops the understanding of cascade use of biomass giving priority to the higher value uses promoting the reuse and recycle of products, raw materials and nutrients. The students explore the technical circulations and biobased circulations under circular economy. The course provides the understanding of circular economy business models as well as provides knowledge of decoupling economy consumption of resources e.g. replacing fossil materials with circular materials in different business fields, e.g. textiles, plastics and construction sector. It focuses also on circular economy design out waste and pollution, keeping products and materials in use and regenerate natural systems. During the course the students apply the circularity in different business fields.

The aim: Providing students with multidisciplinary base on circular economy knowledge and to strengthen students to tackle with global sustainability challenges by benefitting the potential of circular economy and developing innovative solutions towards circular bioeconomy.

Description of the organization and tasks of students' independent work:

During the course, the student prepares two major outputs that take the independent working hours, total 146:

1. **Group work: Case study:** The student assesses local business and identify and describe existing technical and bio/based circulations as well as assess the findings in terms of sustainability. Preparing the case study and preparing presentation for the seminar. (about 42 h)
2. **Pair work: Report: Future circular value chain seminar + peer review:** Using circular economy concept in value chain development: Analysing value chain inefficiencies, applying circular economy business model theoretic and practise-based knowledge as well as tools in identifying value chain development potential circular economy business; creating value chain development proposal. Preparing the report, presentation and preparing oneself for opponent role (106 hours)

Learning outcomes (knowledge, skills and competences)

Learning outcomes	Assessment methods	Levels of achievement		
		Satisfactory	Average	High
KNOWLEDGE				
Demonstrate knowledge about global challenges and megatrends as well as UN sustainability development goals (SDGs) related to European and Central Asian bioeconomy.	Discussion in classes, Quiz	Basic knowledge on global challenges and megatrends as well as SDGs.	Knowledge and understanding on global challenges and megatrends as well as SDGs.	Comprehensive knowledge on global challenges and megatrends as well as SDGs.
Demonstrate knowledge to assess critically and knowledge-based the state of art of technical and bio-based circulations in local bioeconomy in terms of sustainability.	Group work: Case studies of technical and biobased circulations + presentation	The case studies get acquainted with the existing technical and bio-based circulations with low notice on theoretic framework and narrow view in terms of each sustainability perspective; having limited understanding about the taxonomy of resources utilisation.	The case studies succeed to identify and describing the existing technical and bio-based circulations as concepts; all sustainability perspectives are covered in some extent as well as the taxonomy of resources utilisation.	The case study offers over all view on existing technical and bio-based circulations; describes the impact of circulation in all sustainability perspectives and taxonomy; considers the essential theoretic frameworks.
Demonstrate knowledge about identifying and describing value chain inefficiencies, circular economy business potential and the theoretical and real-life knowledge about circular economy business models.	Pair work: Report: Future circular value chain seminar + peer review (+ client feedback)	Report indicates low understanding of inefficiencies of the value chain; limited knowledge about identifying circular economy business model potential; the indicated potential is not well	The report describes the circular economy business model potential of the value chain: it consists of the analysis of value chain inefficiencies and bases the conclusion on	The report consists of the diverse analysis of value chain inefficiencies, consists understanding of operational environment as well as theoretic and real-life based innovative approach on circular business model development.

		justified in terms of theoretic or real-life examples.	knowledge about operational environment; report has theoretic and real-life based approach on circular economy business model development.	
--	--	--	--	--

SKILLS

Professional skills

Ability to assess local business and identify and describe existing technical and bio/based circulations as well as assess the findings in terms of sustainability.	Group work: Case studies of technical and biobased circulations + seminar	Can identify and describe existing technical and bio/based circulations as well as assess the findings briefly in terms of all perspective sustainability. Compares briefly the results in scientific knowledge or practice-based sources.	Ability to assess local business and identify and describe existing technical and bio/based circulations as well as assess the findings with critically in terms of sustainability. Compares the results in scientific knowledge or practice-based sources.	Ability to assess comprehensively local business and identify and describe existing technical and bio/based circulations as well as assess the findings critically and development orientated in terms of sustainability. Compares the results in scientific knowledge and practice-based sources.
Using circular economy concept in value chain development: Analysing value chain inefficiencies, applying circular economy business model theoretic and practise-based knowledge as well as tools in identifying value chain development potential circular economy business; creating value chain development proposal	Pair work: Report: Future circular value chain seminar + peer (and client) review	Shows limited ability to benefit circular economy concept in value chain development: low skills to benefit the tools to analyse value chain inefficiencies, applies only in some extent economy business model theoretic and practise-based knowledge in identifying value chain development potential circular economy business.	Using circular economy concept in value chain development: Analysing value chain inefficiencies, applying circular economy business model theoretic or practise-based knowledge as well as tools in identifying value chain development potential circular economy business.	Using circular economy concept successfully in value chain development: Analysing value chain inefficiencies broadly, applying circular economy business model theoretic and practise-based knowledge as well as tools in identifying value chain development potential circular economy business.

Soft skills				
Skill to come up with creative circular economy solution	Report: Future circular value chain seminar + peer (and client) review	Value chain development proposal was created, yet it has unrealistic approach at some extent; innovation tool was used weakly.	Creating realistic proposal for value chain development; innovation tool was benefitted properly.	Value chain development proposal was innovative or achieved high quality; innovation tool supported the new perspective development.
Skills of communication as preparing explicit, diverse and logical analyse report and presentation about the case study and as well as acting as opponent in peer review process demonstrating understanding of circular value chain as well as constructive criticism.	Presentations in case study and seminar	Preparing Future value chain report and presentation and Case study presentation; acting as an opponent in peer review process providing feedback about the report.	Preparing clear Future value chain report and presentation and Case study presentation; acting as an opponent in peer review process providing professional feedback about the report.	Preparing explicit, diverse and logical Future value chain report and presentation and Case study presentation; acting as an active opponent in peer review process demonstrating understanding of the reviewed circular value chain as well as providing constructive criticism.
Ability to evaluate own knowledge, skills and competences in realistic way	Self-assessment	Being unable to evaluate own knowledge, skills and competences in realistic way	Having realistic view about own knowledge, skills and competences.	Ability to evaluate own knowledge, skills and competences in realistic and constructive way.
(Applied if applicable) Skills of communicating with client	Feedback of client	Inactive level of communication; communication only when needing information; no attention to client's needs	Frequent communication with client;	Frequent and client need orientated communication
COMPETENCE				
The students get familiar with the circular economy (CE) concept in global and local perspective. They understand how CE tackles with the global challenges and promotes UN sustainable development goals (SDGs); The students gain theoretical and practice-based knowledge about		The student knows circular economy (CE) concept in global and local perspective and are able to assess the value chains in terms of sustainability. The students know real-life examples	The student understands circular economy (CE) concept in global and local perspective and analyse and develop the value chains towards circularity and sustainability with the base of	The student understands comprehensively circular economy (CE) concept in global and local perspective and analyse and develop the value chains towards circularity and sustainability with the base of theoretic and practice-based

technical and bio-based circulations, circular economy business models and circular economy business in general as well as in local level. The students learn to define and develop value chains towards circularity as well as think and argue about circular economy in global perspective and in local context.		circular economy business based on technical and biobased circulations. The student is able to discuss about circular economy in global perspective and in local context.	theoretic or practice-based knowledge. The students are able to think and argue about circular economy in global perspective and in local context.	knowledge. The students are able to think and argue critically about circular economy in global perspective and in local context.
--	--	---	--	---

Requirements for awarding credit points: 7

Knowledge assessment and prerequisites for taking a test or examination

* 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	Percentage	Assessment deadline
Communication skills (discussions and other oral communication, written communication, client feedback)	Communication skills	10	During the entire semester
Sustainability quiz: Global challenges, megatrends, UN sustainability development goals (SDGs)	Quiz	10	Within the specified time for the test
Group work: Case study (Technical and bio-based circulations, sustainability)	Teacher's evaluation of presentation	30	Deadline of the case study presentation
Pair work: Report: Future circular value chain seminar + peer review (+ client feedback)	Teacher's evaluation of report, peer review (+ client feedback)	50	Deadline of the report
Total		100	-

1. Lectures

1. Global challenges.
2. Megatrends.
3. United Nations Sustainable development goals (SDGs).
4. Sustainability in daily life.
5. Why circular economy? (Inefficiencies of traditional businesses)
6. Critical raw materials.
7. Economic, social and ecological potential of circular economy.
8. Bases of technical circulations:
 - a. waste and side streams in EU and in Uzbekistan;

- b. industrial symbiosis in EU and in Uzbekistan.
- 9. Bases of biobased circulations:
 - a. nutrient recycling;
 - b. carbon capture;
 - c. renewable energy;
 - d. Innovative bio-based products.
- 10. Circular textiles.
- 11. Circular plastics.
- 12. Circular building materials.
- 13. Sustainable packing.
- 14. Circular economy business models: Circular supply chain.
- 15. Circular economy business models: Recovery & recycling.
- 16. Circular economy business models: Sharing platforms.
- 17. Circular economy business models: Product as service.
- 18. Circular economy business models: Product life extension.
- 19. Tools towards circularity:
 - a. Business model development toolkit;
 - b. Value case tool;
 - c. Maturity assessment tools.
- 20. Transformation analysis (cultural gap, ecosystem partners, funding requirement).
- 21. Circular economy opportunities for the consumer goods sector.
- 22. Global supply chain.
- 23. Systemic change.
- 24. Limitation of circular economy.
- 25. Promoting circular economy in state and EU level – case Finland.
- 26. Circular economy indicators.

2. Practicals

- 1. Exploring United Nations Sustainable development goals in general, in the context of bioeconomy and in Uzbekistan.
- 2. Sustainability in daily life tests.
- 3. Exploring inefficiencies in local bioeconomy.
- 4. Bio-based by streams in Uzbekistan (group work).
- 5. Plastics in Uzbekistan bioeconomy (group work).
- 6. Exploring CDP-lists of companies and cities.
- 7. Exercises about circular value chains.
- 8. Innovation – idea development.
- 9. Seminar about case studies and about future value chains.
- 10. World circular economy forum and/or other current circular economy events.

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

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

N. b. Circular economy is very fast developing topic and therefore there are good materials coming up all the time. Therefore, it would be important to use the latest materials to complete the sources of information.

1. Ellen MacArthur foundation publications, e.g.
 - a. Ellen MacArthur Foundation 2013. Towards the Circular Economy. Economic and business rationale for an accelerated transition. <https://emf.thirdlight.com/link/x8ay372a3r11-k6775n/@/preview/1?o>
 - b. Ellen MacArthur Foundation 2013. Towards Circular Economy. Opportunities for the consumer goods sector. <https://emf.thirdlight.com/link/coj8yt1jogq8-hkhkq2/@/preview/1?o>
 - c. Ellen MacArthur playlists in YouTube, <https://www.youtube.com/user/made2bemadeagain>
 - d. Other relevant not yet published materials by Ellen MacArthur foundation
2. Sitra publications, e.g.
 - a. Sitra 2021. The winning recipe of circular economy. <https://www.sitra.fi/en/publications/the-winning-recipe-for-a-circular-economy/>
 - b. Sitra 2020. Trading services for a circular economy. <https://www.sitra.fi/en/publications/trading-services-for-a-circular-economy/>
 - c. Sitra 2021. [Most interesting companies in the circular economy in Finland 2.1 - Sitra](#)
 - d. Sitra 2019. [New business models play a key role in enterprises' strategies - Sitra](#)
 - e. Sitra. [Inspiring circular economy solutions from around the globe - Sitra](#)
 - f. Sitra 2021. <https://www.sitra.fi/en/articles/41-pioneering-finnish-circular-economy-companies/>
 - g. Other relevant not yet published materials by Sitra (e.g. Circular economy playbook version to be published in 2022)
3. Scott, G.1999. Polymers and the Environment. The Royal Society of Chemistry.
4. Björkqvist, I. 2018. The Effect of Mechanical Recycling for Processability of HDPE, Bioproduct and Process Technology. TAMK. Final thesis <http://urn.fi/URN:NBN:fi:amk-201905067893>
5. Korhonen, J., Honkasalo, A. Seppälä, J. 2016. Circular Economy: The Concept and its Limitations. https://www.researchgate.net/profile/Jouni-Korhonen/publication/318385030_Circular_Economy_The_Concept_and_its_Limitations/links/5a53e343a6fdc3e2e28b99/Circular-Economy-The-Concept-and-its-Limitations.pdf
6. Cantú, A.; Aguiñaga, E.; Scheel, C. Learning from Failure and Success: The Challenges for Circular Economy Implementation in SMEs in an Emerging Economy. Sustainability 2021, 13, 1529. <https://doi.org/10.3390/su13031529>
7. Philp, J. and D. Winickoff (2018), "Realising the circular bioeconomy", OECD Science, Technology and Industry Policy Papers, No. 60, OECD Publishing, Paris, <https://doi.org/10.1787/31bb2345-en>
8. Transparency of transformation: a chain. CDP Global Supply Chain Report 2020, https://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/005/554/original/CDP_SC_Report_2020.pdf?1614160765
9. Hofstetter & al. 2021. From Sustainable Global Value Chains to Circular Economy—Different Silos, Different Perspectives, but Many Opportunities to Build Bridges, <https://link.springer.com/content/pdf/10.1007/s43615-021-00015-2.pdf>
10. Tadas Radavičius, T. & Tvaronavičienė, M. 2021. Circular Supply Chain: Literature Review and Theoretical Framework, <http://cibmee.vgtu.lt/index.php/verslas/2021/paper/viewFile/650/229>
11. Dumée, L.F. Circular Materials and Circular Design—Review on Challenges Towards Sustainable Manufacturing and Recycling. Circ.Econ.Sust. (2021). <https://doi.org/10.1007/s43615-021-00085-2>
12. Webster, K. A Circular Economy Is About the Economy. Circ.Econ.Sust. 1, 115–126 (2021). <https://doi.org/10.1007/s43615-021-00034-z>

