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**Federal State Autonomous Educational Institution for Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA (RUDN University)
named after Patrice Lumumba**

Institute of Environmental Engineering

COURSE SYLLABUS

Basics of Circular Economics

Recommended by the Didactic Council for the Education Field for the specialization:
05.04.06 "Ecology and Nature Management"

**The course instruction is implemented within the professional education programme
of higher education:**

«Integrated Solid Waste Management»

1. COURSE GOAL(s)

The course is designed to help students to obtain the complex theoretical and applied knowledge about the circular economy, developing skills in the field of economic mechanisms of environmental protection, as well as studying the conditions and possibilities for transforming the technogenic type of economic development into a circular one.

• 2. REQUIREMENTS FOR COURSE OUTCOMES

The course implementation is aimed at the development of the following competences:

Competence code	Competence descriptor	Competence formation indicators (within this course)
PC-6	the ability to diagnose problems of nature conservation, develop practical recommendations for its protection and sustainable development	PC-1.1 Capable of carrying out the necessary calculations for planning, modeling and forecasting the development of a territorial object
		PC-1.2 Is able to analyze and evaluate the available resources and conditions necessary for the implementation of research
		PC-1.3 Capable of conducting spatial, territorial, demographic, sociological, economic research, topographic and geodetic, engineering geological, cartographic surveys

As a result of course studying, the student must:

Know:

- theoretical foundations of sustainable development and circular economy;
- mechanisms and principles of the circular economy;
- regulatory framework in the field of "green" economy and sustainable development;

Be able to:

- develop a strategy for the development of a circular economy in the region;
- calculate fees for negative environmental impact;
- calculate the environmental fee;
- assess natural benefits using various methodological approaches;
- calculate environmental damage;
- select best available techniques (BAT) from reference books in accordance with performance criteria;

Own :

- skills in working with design and engineering documentation;
- skills of working with normative - legal documentation.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

Discipline *Basics of the Circular Economy* refers to the **Electives** block 1 of the curriculum. Within the higher education programme students also master other disciplines (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the

course. **Table 3.1**

The list of the higher education programme components that contribute to the achievement of the expected learning outcomes

Competence code	Competence descriptor	Previous courses/modules, internships*	Subsequent courses/modules, internships*
PC-6	the ability to diagnose problems of nature conservation, develop practical recommendations for its protection and sustainable development	Research Work;	Research Work; Management of environmental-economic risks; Environmental norms for sustainability; Modern remediation technologies; Pre-graduation Practical Training;

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the discipline is **4** credit units.

Table 4.1. Types of academic activities during the period of the HE program(me) mastering

Types of academic activities		Total hours	Semester(s)			
			1	2	3	4
<i>Contact academic hours</i>		<i>18</i>		<i>18</i>		
Lectures		9		9		
Lab works						
Seminars (workshops/tutorials)		9		9		
<i>Self-study</i>		<i>99</i>		<i>99</i>		
<i>Evaluation and assessment (exam; pass/fail grading)</i>		<i>27</i>		<i>27</i>		
The total course workload	hours	144		144		
	credits	4		4		

5. COURSE CONTENT

Table 5.1. Course Modules and Contents

Title of Course Modules		Content	Types of academic activities
1.	The essence and content of a green or circular economy	Economic content of green economy and sustainable development. Definition of green economy and sustainable development.	L, S
		Functions, goals and objectives of the green economy. The concept and current trends in the development of the circular economy. Principles and tools of the "green economy" and its contribution to the transition to sustainable development.	L, S
2	Economic mechanisms for environmental	Principles and instruments of the "green economy" and its contribution to the transition to sustainable development	L, S

	protection	Indicators of sustainable development. OECD indicator systems. UNCSO indicator systems. Economic levers of implementation	
		Payment for negative impact on the environment. Environmental fee and manufacturer's responsibility.	L, S
		Environmental entrepreneurship. Ecological insurance	
		State support for economic and (or) other activities carried out for the purpose of environmental protection. Basic legal documents regulating environmental principles.	L, S
3	The economic value of nature and the nature management efficiency	The need to determine the economic value of nature. National wealth and its composition. Indicators of national wealth (method of the World Bank).	L, S
		Accounting for the environmental factor in the main indicators of economic development.	L, S
		Implementation of the principles of green development: "polluter pays (PP)" and implementation of policy 3 R . The concept of consumer surplus.	L, S
4	Conditions and possibilities of transformation of the technogenic type of economic development into a circular economy	The need for a transition to a sustainable type of development and the introduction of elements of a "green" economy.	L, S
		Limitations of technogenic development: environmental (degradation and depletion of natural resources, pollution and waste), economic (investment), social (ill health, environmental migrants).	L, S
		Alternative options for solving environmental problems; development of low-waste and resourcesaving technologies; technological changes; direct environmental protection measures.	L, S
		Reducing the share of natural resource industries and increasing the share of knowledge-intensive high-tech industries	L, S
5	Legislation in the field of environmental protection and the concept of "best available technology (BAT)"	Mechanisms for the implementation of environmental and economic policy: direct regulation (state influence), economic incentives (market mechanisms), mixed mechanisms. Formation of environmental legislation.	L, S
		The role of the state in the formation of a circular economy.	L, S

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the course (if necessary)
Lecture	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless Internet connection. Software: Microsoft Windows, MS Office / Office 365, MS Teams, Chrome (latest stable release), Skype.
Seminars	Classroom, equipped with a set of specialized furniture; whiteboard; a set of devices includes portable multimedia projector, laptop, projection screen, stable wireless	Microsoft Windows 7 corporate. License No. 5190227, date of issue March 16, 2010 MS Office 2007 Prof , License # 6842818, date of issue 09/07/2009
Computer Lab	Computer Lab for conducting classes, group and individual consultations, current control and intermediate certification, equipped with personal computers (in the amount of 12), a board (screen) and technical devices of multimedia presentations.	INTEGRAL
For Self-Study	Classroom for self-study (can be used for seminars and consultations), equipped with a set of devices includes laptop, stable wireless.	No

7. RECOMMENDED SOURCES FOR COURSE STUDIES

a) Main reading:

1 Tambovceva T., Titko J. Introduction to circular economy // Ekonomikas un kulturas augstskola. – 2020 материалы размещены в системе ТУИС РУДН

b) Additional reading

1 Neugarten, R.A., Langhammer, P.F., Osipova, E., Bagstad, K.J., Bhagabati, N., Butchart, S.H.M., Dudley, N., Elliott, V., Gerber, L.R., Gutierrez Arrellano, C., Ivanić, K.-Z., Kettunen, M., Mandle, L., Merriman, J.C., Mulligan, M., Peh, K.S.-H., Raudsepp-Hearne, C., Semmens, D.J., Stolton, S., Willcock, S. (2018). Tools for measuring, modelling, and valuing ecosystem services: Guidance for Key Biodiversity Areas, natural World Heritage Sites, and protected areas. Gland, Switzerland: IUCN. x + 70pp., материалы размещены в системе ТУИС РУДН
2 The report of Material Economics. The Circular Economy – a Powerful Force for Climate Mitigation, 2018, 176 pp., материалы размещены в системе ТУИС РУДН

3 Ecosystem Management: adaptive, community-based conservation / by Gary K. Meffe ... [et al.] Island Press .- 2002.- 333 p ., материалы размещены в системе ТУИС РУДН

4 The Ellen MacArthur Foundation's report "Towards the circular economy. Economic and business rationale for an accelerated transition", 2013 Vol. 1.- 91 pp., материалы размещены в системе ТУИС РУДН

Internet-based sources

1. ELS of RUDN University and third-party ELS, to which university students have access on the basis of concluded agreements:

- RUDN Electronic Library System - RUDN EBS <http://lib.rudn.ru/MegaPro/Web>
- ELS "University Library Online" <http://www.biblioclub.ru>
- EBS Yurayt <http://www.biblio-online.ru>
- ELS "Student Consultant" www.studentlibrary.ru
- EBS "Lan" <http://e.lanbook.com/>
- EBS "Trinity Bridge"

2. Databases and search engines:

- electronic fund of legal and normative-technical documentation <http://docs.cntd.ru/>
- Yandex search engine [https:// www .yandex.ru/](https://www.yandex.ru/)
- Google search engine <https://www.google.ru/>
- abstract database SCOPUS [http:// www .elsevierscience.ru/ products / scopus /](http://www.elsevierscience.ru/products/scopus/)

8. MID-TERM ASSESSMENT AND EVALUATION TOOLKIT

Evaluation materials and a point- rating system* for assessing the level of competence formation (part of competences) based on the results of mastering the discipline **Basics of the Circular Economy** are presented in the Appendix to this Work Program of the discipline.

DEVELOPER:

Associate Professor of the
ES&PQM Department

Popkova A.V.

_____ Position	_____ Signature	_____ Name, Surname
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HEAD OF DEPARTMENT:

Director of ES&PQM Department

Savenkova E.V.

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HEAD OF PROGRAMME:

Associate Professor of the
EM Department

Kapralova D.O.

_____ Position	_____ Signature	_____ Name, Surname
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Department Environmental Safety and Product Quality Management

educational department to be specified

APPROVED

Department meeting protocol No_____,

Dated _____

day, month, year

Head of Educational Department

_____(Savenkova E.V.)

signature

ASSESSMENT TOOLKIT

for the course

Basics of Circular Economics

05.04.06 "Ecology and nature management"

field of studies / speciality code and title

«Integrated Solid Waste Management

higher education programme profile/specialisation title

Master

graduate's qualification (degree)

Passport to Assessment Toolkit for Course Basics of Circular Economics

Field of Studies / Speciality 05.04.06 "Ecology and nature management"/ «Integrated Solid Waste Management»

Course: Basics of Circular Economics

Competences (competences in part) under assessment	Course module under assessment	Course topic under assessment	Tools to assess higher education programme mastering level										Points for topic	Points for module
			Class work					Self-studies				Exam/Pass-fail assessment		
			Quiz	Test	Work with lecture materials	Work at the seminars	Lab work	Homework	Research essay/ Library research paper	Calculation and graphic work	Group work project			
GPC-2	Module 1. Circular economy: conceptual basics	Economic content of green economy and sustainable development. Definition of green economy and sustainable development.	1	1	1	1					3		7	14
		Functions, goals and objectives of the green economy. The concept and current trends in the development of the circular economy. Principles and	1	1	1	1					3		7	

		tools of the "green economy" and its contribution to the transition to sustainable development.												
GPC-2 PC-6	Module 2. Economic mechanisms for environmental protection	Indicators of sustainable development. OECD indicator systems. UNCSD indicator systems. Economic levers of implementation.	1	1	1	1					2		6	19
		Payment for negative impact on the environment. Environmental fee and manufacturer's responsibility. Environmental entrepreneurship. Ecological insurance.	1	2	1	1					2		7	
		State support for economic and (or) other activities carried out for the purpose of environmental protection. Basic legal documents regulating environmental principles.	1	1	1	1					2		6	
	Module 3. The economic value of nature and the nature	The need to determine the economic value of nature. National wealth and its composition. Indicators of	1	2	1	1					3		8	24

	management efficiency	national wealth (method of the World Bank).												
		Accounting for the environmental factor in the main indicators of economic development.	1	2	1	1					3		8	
		Implementation of the principles of green development: "polluter pays (PP)" and implementation of policy 3 R . The concept of consumer surplus.	1	2	1	1					3		8	
GPC-2 PC-6	Module 4. Towards circular economy: conditions and opportunities for the transformation of the technogenic type of economic development	The need for a transition to a sustainable type of development and the introduction of elements of a "green" economy.	1	1	1	1					2		6	19
		Limitations of technogenic development: environmental (degradation and depletion of natural resources, pollution and waste), economic (investment), social (ill health, environmental migrants).	1	1	1	1					2		6	

		Alternative options for solving environmental problems; development of low-waste and resourcesaving technologies; technological changes; direct environmental protection measures. Reducing the share of natural resource industries and increasing the share of knowledge-intensive hightech industries	1	2	1	1					2		7	
GPC-2	Module 5. Legislation in the field of environmental protection and the concept of “best available technology (BAT)”	Mechanisms for the implementation of environmental and economic policy: direct regulation (state influence), economic incentives (market mechanisms), mixed mechanisms. Formation of environmental legislation.	1	1	1	1					2		6	10
		The role of the state in the formation of a circular economy.	1	1		1					1		4	
		TOTAL	13	18	12	13					30	14	86	86

Course Basics of Circular Economics

QUESTION CARD No 1

QUESTION 1 International aspects of the formation of a green economy QUESTION

2 Cultural ecosystem services

3 *

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day, month, year

Note * Practice case/task inclusion is subject to the teacher's discretion.

The set of exam question cards is complemented by the assessment criteria developed by the teacher and approved at the department meeting.

Assessment criteria:

(in compliance with the legal regulations in force)

EXAM QUESTIONS

1. Green economy. Definition. Main features.
2. Evolution of green economy ideas.
3. International aspects of the formation of a circular economy.
4. Resolution of the UN Conference on Sustainable Development "The Future We Want" on the ideas of a green economy. Green economy in the context of sustainable development.
5. Capital. Definition. Types of capital within the framework of the green economy concept.
6. Human capital. Natural capital. Physical capital.
7. Ecosystem services. Definition. Classification.
8. Providing ecosystem services.
9. Regulating ecosystem services.
10. Cultural ecosystem services.
11. Supporting ecosystem services.
12. Methods for the economic valuation of ecosystem services.
13. The potential of remote sensing technologies in ecosystem services assessment
14. The application of NDWI for ecosystem services assessment
15. The concepts of green economy: its origins and evolution.
16. Closed-loop Economy.
17. Diversification and decarbonization of the economy.
18. The concept of a low-carbon economy.
19. Comparative analysis of traditional and alternative energy chains.
20. Cyclical economy. Basic principles and instruments.
21. Framework indicators for sustainable development, developed by the UN Commission on Sustainable Development.
22. Linear and circular business models.

23. Stages of product life cycle assessment.
24. Closed loop and open loop material recycling systems.
25. Approaches to the definition of enterprises sustainable development.
26. Components of corporate sustainable development of the enterprise.
27. Corporate social responsibility and methods of its assessment.
28. Indicators of environmental performance of the enterprise.
29. Industrial symbiosis.
30. The main stages of assessing the life cycle of products.

Tentative list of assessment tools

No	Assessment tool	Brief features	Assessment tool representation in the kit
<i>Class work</i>			
1	Survey/Quiz	A tool of control, organised as a special conversation between a teacher and students on topics related to the course under study, and designed to clarify the amount of students' knowledge in a particular section, topic, problem, etc.	Questions on the course topics /modules
2	Test	A system of standardised tasks that allows the teacher to automate the procedure for measuring the student's level of knowledge and skills	Tests bank
3	Control work	A tool of control organised as a classroom lesson, at which students need to independently demonstrate the acquisition and mastering of the educational material of the course topic, section, or sections.	Questions on the course topics /modules
4	Round table, discussion, polemic, dispute, debate, (class work)	Evaluation tools that allow the teacher to engage students in the process of discussing controversial issues, problems and assess their ability to argue their own point of view.	List of themes for round tables, discussions, polemics, disputes, debates.
5	Business game and/or role play	Joint activities of a student group under the teacher's control to solve educational and professionally oriented tasks through the simulation of a real-world problem; this activity allows the teacher to assess the students' ability to analyse and solve typical professional challenges.	Topic (problem), concept, roles and expected results for each game
6.	Presentation (defence) of project/report/ Library research paper /briefs *	A tool for monitoring the students' ability to present the work results to the audience.	Themes for projects/reports/ Library research paper/ briefs

7	Pass/Fail assessment	A tool for checking the quality of students' performance of laboratory work, acquisition and mastering of the practice training and seminar educational material, successful completion of the advanced field internship and pre-graduate internship and fulfillment of all training assignments in the course of these internships in accordance with the approved programme.	Tasks examples
8	Exam	The evaluation of the student's work during the semester (year, the entire period of study, etc.); it is designed to identify the level, soundness and systematic nature of theoretical and practical knowledge gained by the student, formation of independent work skills, development of creative thinking, ability to synthesise the acquired knowledge and apply it to solve practice tasks	Examples of tasks/questions/exam question cards
9	Case	A problem-solving task in which the student is asked to comprehend the real work-related (occupational) situation necessary to solve the problem.	Assignments to solve the case
10	Multi-level tasks and assignments with varying difficulty	The tasks and assignments differ in terms of the following levels: a) reproductive level allows the teacher to evaluate and diagnose the students' knowledge of factual material (basic concepts, algorithms, facts) and the students' ability to correctly use special terms and concepts, recognize objects of study within a certain section of the discipline, b) reconstructive level allows the teacher to evaluate and diagnose the students' abilities to synthesise, analyse, generalise factual and theoretical material and formulate specific conclusions, establish cause-and-effect relationships, c) creative level allows to evaluate and diagnose students' skills to integrate knowledge of various fields, argue their own point of view.	Set of multi-level tasks and assignments with varying difficulty
<i>Self- studies</i>			
1	Calculation and graphic work	A tool for checking students' skills in applying the acquired knowledge according to a predetermined methodology in task solving or fulfilling assignments for a module or discipline as a whole.	Set of tasks for calculation and graphic work

2	Course work/project	A type of independent written work aimed at the creative development of general professional and specialised professional disciplines (modules) and the development of relevant professional competences	Course assignment themes
3	Project	The final “product” that results from planning and performance of educational and research tasks set; it allows the teacher to assess the students’ ability to independently shape their knowledge in the course of solving practice tasks and problems, navigate in the information environment and the students’ level of analytical, research skills, skills of practical and creative thinking; it can be implemented individually or by a group of students.	Themes for team-based or individual projects
4	Research essay (Library research paper)	The student’s independent work in writing that summarises the results of the theoretical analysis of a certain scientific (educational and research) topic, where the author reveals the essence of the problem under study, considers different points of view, as well as argues his/her views on the material under consideration.	Themes for research essay (library research papers)
5	Reports, briefs	The product of the student’s independent work, which is a public performance on the presentation of the results of solving a specific educational, practical, research or scientific topic.	Themes for reports, briefs
6	Essay and other creative assignments	A partially regulated assignment that has a nonstandard solution and allows the teacher to diagnose students’ skills in integrating knowledge from various fields and arguing their own point of view; it can be prepared individually or by a group of students.	Themes for team-based or individual creative assignments
7	Standard calculations	A tool to test skills in applying the acquired knowledge, according to a predetermined methodology, solving tasks or fulfilling assignments for a module or discipline as a whole.	Set of tasks for standard calculations

8	Homework	<p>The tasks and assignments differ in terms of the following levels:</p> <ul style="list-style-type: none"> a) reproductive level allows the teacher to evaluate and diagnose the students' knowledge of factual material (basic concepts, algorithms, facts) and the students' ability to correctly use special terms and concepts, recognize objects of study within a certain section of the discipline, b) reconstructive level allows the teacher to evaluate and diagnose the students' abilities to synthesise, analyse, generalise factual and theoretical material and formulate specific conclusions, establish cause-and-effect relationships, c) creative level allows the teacher to evaluate and diagnose students' skills to integrate knowledge of various fields, argue their own point of view. 	Set of multi-level tasks and assignments with varying difficulty
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Business game

for the course Basics of Circular Economics

1 Theme (problem): Towards circular economy: pros and cons

2 Game conception: the establishment of benefits and disadvantages in regards to circular economy tools implementation for different stockholders

3 Roles:

- government;
- society
- non-profit organizations; - entrepreneurs;

4 Expected outcomes:

Business game helps students to obtain deep understanding of:

- the main approaches to transition of linear economy into the circular one;
 - the basic principles and tools of circular economy;
 - the application possibilities of circular economy model
- Assessment criteria:**
(in compliance with the legal regulations in force)

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Department of Environmental Management and Product Quality Management

Set of assignments for control work

for the course Basics of Circular Economy

course title

1. Establish a correspondence between the type of enterprise and its characteristics

LABOR INTENSIVE ENTERPRISES	High share of labor costs in total production costs
CAPITAL INTENSIVE ENTERPRISES	A significant part of production costs is depreciation

MATERIAL-INTENSIVE ENTERPRISES	A significant part of production costs is the cost of raw materials
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2. The main focus of the Millennium Development Goals is on:

- a) ensuring social well-being
- b) solving environmental problems
- c) development of economic development programs
- d) modernization of technologies in the production sector of the economy

3. Choose the correct formulation of the triple sustainability goal for business:

- a) People, Planet, Profit
- b) Profit, People, Planet
- c) Planet, People, Profit
- d) Planning, Production, Profit

4. Within the framework of what concept were the first ideas of the circular economy formulated?

- a) "Cradle to Cradle", William McDonough and Michael Brongart
- b) "The Blue Economy", Günther Pauli
- c) "Biomimicry", Jeanine M. Benyu
- d) "The Economics of the Future Spaceship Earth", Connet Boulding

5. Choose the subjects related to the external microenvironment of the enterprise:

- a) suppliers of material and technical resources
- b) consumers of products (services) of the enterprise
- c) competitors
- d) enterprise administration

Assessment criteria:

(in compliance with the legal regulations in force)

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Department of Environmental Management and Product Quality Management
Themes for team-based or individual creative assignments/projects
for the course Basics of Circular Economy

For the successful implementation of the green economy concept, it is necessary to take into account the industries specifics. In the works of UNEP, the following priority green economy industries are highlighted: agriculture, fishing, forestry, industry, transport, waste management, energy. New technologies play a key role in the transformation of certain economy's industries. It should be noted that there is a wide range of related terms in relation to this area: "clean" technologies (clean-tech), "green" technologies, eco-innovations. The abovementioned technologies can reduce emissions, discharges and waste generation, as well as increase energy efficiency.

The purpose of the seminar is to analyze the main directions of the transition to a green economy in various industries.

Topics of reports

1. Analysis of the main directions of the transition to a green economy in agriculture.
2. Analysis of the main directions of the transition to a green economy in the forest industry.
3. Analysis of the main directions of the transition to a green economy in transport.
4. Analysis of the main directions of the transition to a green economy in heavy industry (you can choose a specific industry, for example, ferrous and non-ferrous metallurgy, mechanical engineering, etc.).
5. Analysis of the main directions of the transition to a green economy in the oil and gas complex.
6. Analysis of the main directions of the transition to a green economy in fisheries.

Algorithm

1. Brief description of the selected industry and its contribution to the global economy.
2. Contribution of the selected industry to the economy of the Russian Federation * (share of GDP).
3. The main environmental problems in the selected industry of the Russian economy *(problems of emissions, discharges, waste).
4. Technologies to reduce emissions, discharges and waste generation in the selected industry.
5. Technologies to increase energy efficiency in the selected industry.
6. Successful cases of the implementation of the concept of a green economy in the selected industry.

* For international students - can choose the industry of their country economy.

The presented algorithm is applicable to all topics.

Task defense form – Power Point presentation of the report.

Assessment criteria:

(in compliance with the legal regulations in force)

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