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**Federal State Autonomous Educational Institution for Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA NAMED AFTER PATRICE LUMUMBA
(RUDN University)**

Institute of Environmental Engineering

COURSE SYLLABUS

International Standards for GHG Management

Recommended by the Didactic Council for the Education Field of:

05.04.06 "Ecology and Nature Management"

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

Climate Projects Management

1. COURSE GOAL(s)

The course is designed to help students to obtain the complex theoretical and applied knowledge in implementation of international standards on greenhouse gas emissions and absorptions accounting, reporting and management based on the modern methodologies of their quantification and carbon footprint identification.

2. REQUIREMENTS FOR LEARNING OUTCOMES

The process of studying the discipline is aimed at the formation of the following competencies:

Competence code	Competence descriptor	Competence formation indicators
GPC-4	Able to apply regulatory legal acts in the field of ecology and environmental management, standards of professional ethics	GPC-4.1 knows the basics of environmental regulation and the basics of legislation in the field of environmental management
		GPC-4.2 knows how to use and apply regulatory legal acts in the field of ecology and nature management
		GPC-4.3 able to use the norms of professional ethics in his professional activities
PC-1	Able to organize and manage the company's activities using in-depth knowledge in the field of greenhouse gas management	PC-1.1 knows the production and organizational structure of the organization, the regulatory framework for greenhouse gas management
PC-4	Able to carry out an environmental analysis of projects for expansion, reconstruction, modernization of existing production facilities, taking into account the requirements of standards in the field of greenhouse gas management	PC-4.3 able to carry out an environmental analysis of projects for expansion, reconstruction, modernization of existing production facilities, taking into account the requirements of standards in the field of greenhouse gas management

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

Course *International Standards for GHG Management* refers to the **University Disciplines Module** 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*
GPC-4	Able to apply regulatory legal acts in the field of ecology and	International Cooperation in the field of Nature Protection	No

	environmental management, standards of professional ethics		
PC-1	Able to organize and manage the company's activities using in-depth knowledge in the field of greenhouse gas management	Environmental Engineering and Climate Change	Industrial Internship Pre-graduate Internship
PC-4	Able to carry out an environmental analysis of projects for expansion, reconstruction, modernization of existing production facilities, taking into account the requirements of standards in the field of greenhouse gas management	Carbon Cycles	Climate Project Development Climate Change Models Pre-graduate Internship

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course 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>						
Lectures		18		18		
Lab works						
Seminars (workshops/tutorials)		18		18		
<i>Self-study</i>		99		99		
<i>Evaluation and assessment (exam; pass/fail grading)</i>		9		9		
The total course workload	hours	144		144		
	credits	4		4		

5. COURSE CONTENTS

Table 5.1. The content of the discipline (module) by type of educational work

Title of Course Modules	Content	Types of academic activities
Introduction	International practice of GHG modelling, accounting and management. Environmental standards and norms and carbon regulation. IPCC recommendations. GHG quantification methodologies and their hierarchy	L, S
GHG reporting	ISO 14064-1:2018 as a base for GHG accounting and reporting. National specificities of implementation	L, S
Projects on GHG management	ISO 14064-2:2019, GHG-projects and their validation	L, S
GHG validation and verification activities	ISO-14064-3:2018, ISO 14065:2020, ISO 14066:2011 and organization of validation and verification activities. GHG validation and verification bodies. International practice. Implementation in Russia.	L, S

Title of Course Modules	Content	Types of academic activities
Carbon footprint and its assessment	LCA models according to ISO 14040. Carbon footprint assessment on the base of ISO 14067:2018. Main principles, requirements, methodologies	L, S
GHG management in the industrial sectors	ISO/TR 14069:2013 Greenhouse gases. Quantification and reporting of greenhouse gas emissions for organizations. Guidance for the application of ISO 14064-1 ISO 14080:2018 Greenhouse gas management and related activities. Framework and principles for methodologies on climate actions ISO 14083:2023 Greenhouse gases. Quantification and reporting of greenhouse gas emissions arising from transport chain operations ISO 14097:2021 Greenhouse gas management and related activities. Framework including principles and requirements for assessing and reporting investments and financing activities related to climate change. ISO 14068-1:2023 Climate change management. Transition to net zero. Part 1: Carbon neutrality ISO 6338-1:2024. Calculations of greenhouse gas (GHG) emissions throughout the liquefied natural gas (LNG) chain. Part 1: General ISO 14385-1:2014 Stationary source emissions. Greenhouse gases. Part 1: Calibration of automated measuring systems and ISO 14385-2:2014 Stationary source emissions. Greenhouse gases. Part 2: Ongoing quality control of automated measuring systems	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	

Classroom for Academic Activity Type	Classroom equipment	Specialized educational / laboratory equipment, software and materials for mastering the course (if necessary)
		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
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. RESOURCES RECOMMENDED FOR COURSE STUDY

Main reading:

1. Schaltegger S, Christ KL, Wenzig J, Burritt RL. Corporate sustainability management accounting and multi-level links for sustainability–A systematic review. International journal of management reviews. 2022 Oct;24(4):480-500. URL: <https://doi.org/10.1111/ijmr.12288>
2. Ahmetoğlu S, Tanık A. Management of carbon footprint and determination of GHG emission sources in construction sector. International Journal of Environment and Geoinformatics. 2020 Aug 8;7(2):191-204. <https://doi.org/10.30897/ijegeo.726913>

Additional reading:

1. ISO 14064-1:2018 Greenhouse gases. Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.
2. ISO 14064-2:2019 Greenhouse gases. Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements.
3. ISO 14064-3:2019 Greenhouse gases. Part 3: Specification with guidance for the verification and validation of greenhouse gas statements.
4. ISO 14067:2018 . Greenhouse gases. Carbon footprint of products. Requirements and guidelines for quantification.

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. ASSESSMENT TOOLKIT AND GRADING SYSTEM FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION

The assessment toolkit and the grading system to evaluate the level of competences (competences in part) formation as results of mastering the discipline are specified in the Appendix to the syllabus.

DEVELOPER:

Professor of the ES&PQM Department		Redina M.M.
Position	Signature	Name, Surname

HEAD OF DEPARTMENT:

Director of ES&PQM Department		Savenkova E.V.
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Institute of Environmental Engineering

ASSESSMENT TOOLKIT

International Standards for GHG Management

Recommended by the Didactic Council for the Education Field of:
05.04.06 "Ecology and nature management"

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

Climate Project Management

Passport to Assessment Toolkit for Course International Standards for GHG Management

Education Field / Speciality 05.04.06 "Ecology and nature management"/ «Climate Projects Management»

Course: International Standards for GHG Management

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 course
			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/ Presentation	Calculation and graphic work	Group work project		
GPC-4 PC-1 PC-4	Introduction	International practice of GHG modelling, accounting and management. Environmental standards and norms and carbon regulation. IPCC recommendations. GHG quantification	2		2	2						6	6

		methodologies and their hierarchy												
GPC-4 PC-1 PC-4	GHG reporting	ISO 14064-1:2018 as a base for GHG accounting and reporting. National specificities of implementation	2		2	2							6	6
GPC-4 PC-1 PC-4	Projects on GHG management	ISO 14064-2:2019, GHG-projects and their validation	2		2	2							6	6
GPC-4 PC-1 PC-4	GHG validation and verification activities	ISO-14064-3:2018, ISO 14065:2020, ISO 14066: 2011 and organization of validation and verification activities. GHG validation and verification bodies. International practice. Implementation in Russia.	2		2	2							6	6
GPC-4 PC-1 PC-4	Carbon footprint and its assessment	LCA models according to ISO 14040. Carbon footprint assessment on the base of ISO 14067:2018. Main principles, requirements, methodologies	2		2	2							6	6
GPC-4 PC-1 PC-4	GHG management in the industrial sectors	ISO/TR 14069:2013 Greenhouse gases. Quantification and reporting of greenhouse gas emissions for organizations. Guidance for the application of ISO 14064-1 ISO 14080:2018 Greenhouse gas management and related	2		2	2							6	6

[illegible]

		emissions. Greenhouse gases. Part 2: Ongoing quality control of automated measuring systems												
		TOTAL	12		12	12			20		30	14	100	100

Course International Standards for GHG Management

QUESTION CARD No 1

QUESTION 1. GHG sources and sinks: main concepts and examples.

QUESTION 2. Carbon footprint of the project: main stages.

3 *

Developer _____ (Redina Margarita)
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Head of Educational Department _____ (Savenkova Elena)
signature

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. What are greenhouse gases? List them and briefly describe their sources. How will they be presented in the GHG report according to the ISO 14064-1:2018?
2. What is a global warming potential? Give a comparative assessment of the GWP for 2-3 GHGs. How will they be presented in the GHG report according to the ISO 14064-1:2018?
3. What are the GHG sources according to the definition in the international standard ISO 14064-1? Give some examples.
4. What are the GHG sinks according to the definition in the international standard ISO 14064-1? Give some examples.
5. What is a carbon footprint? For what objects can it be calculated according to the international standard ISO 14067? Give an example.
6. What is a product category rule according to the international standard ISO 14067?
7. What methodologies (approaches to the calculation) for the quantification of GHG emissions do you know? Give a brief description for 1-2 methodologies.
8. Give a brief characteristic of GHG absorption technologies. What can be environmental limitation for their practical implementation? How can they be presented in a GHG project according to the ISO 14064-2:2019?
9. What are the main principles of the GHG management according to the ISO 14064-1:2018?
10. Give a brief characteristic to the international cooperation in the field of GHG standards development and implementation.
11. What is an information system on GHG according to the ISO 14064-1: 2018?
12. What are the main stages of a carbon footprint assessment?
13. What methodologies can be used to quantify the GHG emissions for the reporting based on the ISO 14064-1:2018 requirements?
14. What are the climate projects? How can be estimated it's efficiency?
15. Give an example of implementation of the international GHG standards on the national level.

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	Examples of tasks/questions/exam question cards

		thinking, ability to synthesise the acquired knowledge and apply it to solve practice tasks.	
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	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
5	Standard calculations	A tool to test skills in applying the acquired knowledge, according to a predetermined methodology, solving tasks or fulfilling	Set of tasks for standard calculations

		assignments for a module or discipline as a whole.	
6	Homework	<p>The tasks and assignments differ in terms of the following levels:</p> <p>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,</p> <p>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,</p> <p>c) creative level allows the teacher to evaluate and diagnose students' skills to integrate knowledge of various fields, argue their own point of view.</p>	Set of multi-level tasks and assignments with varying difficulty

Department of Environmental Safety and Product Quality Management

Set of assignments for control work

for the course **International Standards for GHG Management**

1. *According to the international recommendations GHG emissions are to be calculated...:*
 - 1) * for the significant sources contributing a visible amount of GHG; a level of significance should be defined by the reporting organization
 - 2) For all identified sources of GHG
 - 3) for the significant sources contributing a visible amount of GHG; a level of significance should be defined by the UNEP commission
2. *To reduce GHG emissions should be implemented...:*
 - 1) Artificial (technogenic) GHG sinks
 - 2) * both natural and artificial (technogenic) GHG sinks
 - 3) Natural sinks for agricultural emissions and artificial (technogenic) GHG sinks for industry
3. *Verification of GHG is...:*
 - 1) necessary for all types of GHG reports.
 - 2) Is absolutely voluntary
 - 3) *verification is necessary if it is required by the legislation and it can be implemented in case the reporting organization decided to confirm the GHG report.
4. *Emissions of what GHG are traditionally to be controlled in the energy sector?*
 - 1) CO₂, O₃, H₂O
 - 2) *CO₂, CH₄, NO_x
 - 3) O₃, H₂O, CO₂, CH₄
5. *Among the GHGs CO₂, CH₄, N₂O, the highest GWP has...:*
 - 1) CH₄
 - 2) CO₂
 - 3) *N₂O

Assessment criteria:

(in compliance with the legal regulations in force)

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day, month, year

Department of Environmental Safety and Product Quality Management

Set of assignments for presentation

for the course **International Standards for GHG Management**

The topics listed are preliminary; necessary to agree with a teacher!

- 1) Low-carbon strategy of a company (a case study) and implementation of the international GHG standards.*
- 2) GHG management standards for the elimination climate risks of and their practical application: a case study*
- 3) A climate project according to the ISO 14064-2:2019: a case study of the development, realization and assessment of the efficiency*
- 4) National GHG quantification methodologies and their compliance with the international GHG standards*
- 5) GHG validation and verification bodies: national specificity*

Assessment criteria:

(in compliance with the legal regulations in force)

Developer _____ (Margarita Redina)
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Department of Environmental Safety and Product Quality Management

Team-based or individual creative assignments/projects

for the course **International Standards for GHG Management**

The purpose of the project is to implement an international standard ISO 14064-1:2018 to prepare a report on emissions of greenhouse gases for the university campus.

A university is quite a special organization, which main activities are mostly non-industrial. Thus, emissions can be connected with consumption of energy and transportation; the sinks are probably some processes connected with a “breath” (gas exchange) of green areas.

The project is aimed on the preparation of a report on GHG emissions and absorptions and on the development of recommendations on possible decarbonization.

Algorithm

1. Collect data on the university campus characteristics: area, population, green areas, energy consumption during the year.
2. Establish the scope, organizational boundaries and project boundaries.
3. Select the rules for the significance and identify the GHG sources and sinks.
4. Select an approach and the methodology for the quantification for direct and indirect emissions and for absorptions if they are.
5. Calculate the GHG emissions and absorptions.
6. Present the data in a table form according to the ISO 14064-1:2018.
7. Interpretate the data and suggest some recommendations for the improvement.

Task defense form – Power Point presentation of the report.

Assessment criteria:

(in compliance with the legal regulations in force)

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day, month, year

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Professor of the ES&PQM
Department

Position

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