

## Course description

### Tempus project EcoBRU

Course name
<b>Resource-recycling for environmental improvements in the training courses of technical specialists (for teachers of technical schools and colleges)</b>

Expected lecturer qualifications
Teaching experience having an interdisciplinary relationship with the environment (safety-of vital activity, complex using and protection of water resources, hydrology, hydrochemistry, technosphere safety-, environmental engineering, construction, mining, metallurgy, engineering, farming, land reclamation) at least one year. Computer skills (user level)
Knowledge of methods of general and vocational training, conducting lectures, laboratory sessions interactive.
Possession of pedagogical and information technologies.

Lecturer	Educational Institution
<b>Course Director:</b> Gorlova Olga Evgenyevna c.t.s., associate professor of Minerals enrichment department» <b>Other team members:</b> Orekhova Natalya Nikolaevna, d.t.s., associate professor of Minerals enrichment department» Fadeeva Natalya Vladimirovna c.t.s, associate professor of Minerals enrichment department»	Nosov Magnitogorsk State Technical University

Deficit definition
Awareness of the problems of industrial and global recycling, rational waste management for modern civilization from positions environmental, economic, resource and energy conservation. Formation ideas of waste, on the one hand, as a main environmental pollutants, massive accumulation of which poses a threat to the very foundation of human existence and, on the other hand, as valuable products, potentially suitable for recycling and reuse. Possession of information on waste production and consumption volumes of accumulation, about morphological and chemical composition of the waste classification features. Possession of terminology, knowledge of basic concepts and definitions of ecology, environmental protection, life safety, waste management. Knowledge of basic directions and specific technologies for processing municipal solid waste and some industrial wastes. Ability to justify the use of specific methods of waste production and consumption. Knowledge of waste management in Russia and advanced industrial countries. A wide grasp of knowledge and information from various fields for the formation of environmental education.

Required space in the training	Course level	Course type
The course can be used as a standalone module or after completion of the course "Fundamentals of the concept of assessing the impact on the environment" through an integrated program of training of teachers colleges / technical schools.	For the development of the course the students desirable to have knowledge about concept of protection and saving resource.	Professional development. Course format in Moodle – «Structure».

Target group	Duration	Languages
College teachers	36 hours	Russian

### Conditions

<b>Conditions:</b> Computer room, the presence of trained computer with video conferencing.	<b>Other requirements (if applicable)</b> The basic literature existence, its availability in electronic libraries.
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Ladderpoints (1 un.=36 h)	Total Hours	Class work	Independent work (h)
1	36	26	10

### Topicality for EcoBRU\*\*

The specific link with the professional activity:

In order to act an environmentally sound in everyday life and professional work, you must have ecological knowledge about the environment. Knowledge, accumulated and systematic of experience recycling of production and consumption, allows teachers with concrete examples to build a culture ecological behavior of college students. Environmental behavior of future professionals in daily life and professional activity will help to organize the resource-saving and low-waste production and conserve natural resources for future generations.

### Course objectives

Awareness a global problem of the formation and accumulation of waste in all spheres of production and consumption their negative impact on all elements of the biosphere. Knowledge of processes of waste production and consumption ,the concept of waste management Skills and abilities to disclose issues of recycling and disposal the majority of the most important types of industrial and household waste in terms of improving the environment. Understanding of relationships and conflicts between economy, energy and environment, in sustainable management of waste, the introduction of modern tehnolory recycling and disposal of waste, the creation of sustainable environmental systems. Develop students awareness that improve the environment and quality of life is possible due to prevention or reduction of waste generation, resource recycling and waste management, their safe removal and disposal, the use of low-waste technologies. Increased knowledge of teachers for better training of specialists in various fields, the formation of professional competency skills of students, improving their environmental education.

	<b>Educational objectives of the course (see list of verbs used for educational objectives formulating)</b>	<b>Methods and forms of educational process organization</b>	<b>Monitoring forms and evaluation</b>
<b>Специальные знания</b>	<p><b>Learn</b> the types, volumes of waste production and consumption,their properties;</p> <p><b>Represent</b> the global effects of pollution and current accumulated waste;</p> <p><b>Learn</b> modern concepts and approaches to waste management of production and consumption;</p> <p><b>Reproduce</b> methods of processing of municipal solid waste and industrial wastes;</p> <p><b>Identify</b> processes and devices recycling;</p> <p><b>Represent</b> all elements of the biosphere protection from exposure to waste as</p>	<p><b>Interactive learning with a computer:</b></p> <p>Work with text of distance course with the creation of its own notes.</p> <p>Virtual excursion on water treatment plant.</p> <p>Reading in a distance course scientific and journalistic presenting articles.</p> <p>Online discussions.</p> <p>Preparing for classes in the computer lab and to the development of the material using the guide-lines.</p> <p>Performing in the computer lab assignments</p>	<p>Tasks completing for the input of intermediate and final tests (Passed 60% points of the total).</p> <p>Participation in communication teacher - student, helps to clarify the understanding of the basic theoretical positions apprentice course and systematize knowledge of the controlled section of the program.</p> <p>Check the results of independent assignments. (Passed for the answer, showing not only the result, but the process</p>

**Methodological and didactic competence**

an interdisciplinary task.

**Classify** waste production and consumption on various grounds;

**Interpret** the experience of formation and accumulation of waste from a position of human impact on the elements of the biosphere;

**Explain** the importance of waste management for resource conservation and enhancement of the environment;

**Explain** the physical and chemical nature of recycling methods of production and consumption;

**Compare** technology waste their environmental hazard;

**Apply** environmental and engineering concepts;

**Illustrate** the lecture material with practical examples;

**Make** clear the need to resource-saving recycling to improve the environment;

**Implement** an interdisciplinary approach to the analysis and justification of decisions;

**Explain** and describe the international experience of waste management;

**Lead** a discussion on environmental issues, environmental behavior, environmental management;

**Develop** a program of training courses with the inclusion of environmental topics.

**Interdisciplinary competence, social competence**

**Demonstrate** the capabilities of basic sciences for applications from environmental impact of waste;  
**Use** knowledge and skills from different disciplines for the organization of environmental protection in the future professional activity;  
**Use** the conceptual apparatus and vocabulary relat-

specified in methodological recommendations with the course materials

The program lecture development on the subject includes materials about protection of the environment from waste.

Prepare a presentation which will be available revealing for students of the college the point technological solution for recycling waste-specific production or consumption of 5-10 slides (on the instructions of the curator).

achieving the result with reference to the previously studied material).

Online conference.

(Credit for active participation in the conference with a report and presentation to the developed lectures and discussions on the work of other participants).

Online conference.

Online discussion with experts from different fields of knowledge.

ed sciences and industries - understanding of the links between the different disciplines and psychological readiness to apply knowledge of relevant disciplines in the study of others;  
**Demonstrate** a conscious positive attitude towards ecological orientation of technical activities within a particular specialty.

Themes / Content	Class work	Hours and tasks for independent work
<p><b>Basis concepts and characteristics of the problem of education and waste management</b></p> <p>Problems of pollution and waste classification. Types of waste, pollution limits and indices of environmental quality. Classification of waste. Status of waste in Russian Federation. Legislation of Russian Federation in the field of waste management. Federal classification catalog of waste. International Classification of industrial waste. Classes of hazardous waste. The impact of waste on the environment and quality of life. Environmental control system of waste management.</p>	2	1
<p><b>Current status of municipal solid waste</b></p> <p>Classification of solid waste. A brief history of the problem of solid waste. Accumulation volume, composition and structure of solid waste disposal. Modern trends in education MSW. Collection and disposal of solid waste. The experience of industrialized countries.</p>	2	1
<p><b>The main directions of the processing of municipal solid waste</b></p> <p>Deposition of solid waste to landfills. Requirements of laws of Russian Federation to the disposal of waste on the ground. Landfills for the disposal of solid waste. Utilization of landfill gas. Isolation of polygons. Increased service life of polygons. The scheme of "waste-processing plant - the landfill." Composting of MSW. Recycling of solid waste in anaerobic systems.</p>	2	1
<p><b>Processing of municipal solid waste from the extraction of secondary resources</b></p> <p>Recycling of waste paper. Recycling cans. Cullet. Tires. Technology of high temperature pyrolysis of tires. Construction waste. Food waste and the production of humus. Technological schemes for waste separation.</p>	2	1
<p><b>Thermal methods of processing of municipal solid waste</b></p> <p>Environmental aspects of waste incineration. Classification of methods thermal processing of solid waste. Solid-phase combustion of MSW. Liquid-phase combustion of MSW. Comparison and selection of thermal technologies. Gas cleaning.</p>	2	1
<p><b>Formation of metallic waste in various industries and its processing</b></p> <p>Metal waste in various industries. Measures to reduce the</p>	2	1

current waste. Formation of deposits of waste. Recycling of ferrous and non-ferrous metals. Preparing for remelting scrap. Technology remelting of waste iron and steel. Technology remelting of aluminum and its alloys. Technology remelting waste of copper and copper alloys. Slag processing ferrous and nonferrous metallurgy. Waste heat power as technogenic raw material for rare metals. Recycling ash and slag CHP, CHP and large boilers.		
<b>Plastics and other polymers, waste production and consumption</b> A brief history of plastics. Modified natural materials: rubber, celluloid and casein. Synthetic plastics. Some special types of polymers. Organosilicon polymers (silicones). Metallpolimers. Generation of waste plastic materials. Methods of disposal of different types of waste plastics. Recycling polyethylene and polypropylene. Methods of disposal of gas emissions production of plastics. Recycling of plastic waste in blast furnaces.	2	1
<b>Formation and waste timber</b> Wastes from the production of cardboard and paper. Chemical and power chemical processing of waste wood and solid organic materials. Utilization of lignin. Gasification of solid organic waste materials. Getting gas generator.	4	1
<b>Disposal of your old operation of automobiles</b> Development and problems of auto recycling. European experience in auto recycling. Auto recycling using shredding-systems. Industrial experiments on recycling shredding-dust in blast furnaces.	4	1
<b>Presentation of methods and technologies to protect the environment from waste in teaching technical subjects</b> Techniques and methods formation of representations and understanding in process of studying the protection of the environment from waste. Methods of development creative potential of students on the basis of the synthesis theoretical and practical knowledge. A rough plan of lectures with elements of environmental education in the field of protection the environment from waste. Plan trips to the waste processing company (reprocessing plant toxins). Using virtual tours.	4	1
Total	26	10

<b>Forms of control and assessment</b>			
<b>Control form</b>	<b>Percentage ratio</b>	<b>Dates</b>	<b>Criteria assessment</b>
Test training for the study of technological processes of enrichment and reprocessing of solid waste	40	Beginning, middle and end of the training	60% correct answers – credit.
Creative activity	20	The second half of training	Seminar development on the profile subject of teacher passing retraining ,with the inclusion of her materials for the protection of environment from waste. Presentations preparation available reveals the essence of a particular technological solution for recycling of production or consumption. 5-10 slides - credit.
Online conference	20	At end of the	Active participation in an online conference with a report and

		training	presentation developed lectures, presentations, discussion of other participants - credit.
Online discussion	20	At end of the training	Actively participate in discussions with professional terminology - credit.

**Terms and conditions of access to monitoring and assessment of knowledge (exam)**

Successful development of learners of all elements of the program, performance of assessment knowledge criteria

**Document type certifying the successful course viiting (Certificate?)**

**Organizational guidelines**

**Place:** Computer class, personal computers for students.

**The recommended number of participants:** 15

**Literature and educational materials**

Author	Year	Title	Pages number	Place of publication, publisher or an online link
Main literature				
Potashnikov Y.M.	2004	Disposal of waste production and consumption	107	Tver Publisher TGTU
Bobovich B.B	2013	Processes and devices recycling	288	Moscow Publ: Higher Education
Bobovich B.B., Deviatkin V.V.	2000	Recycling of production and consumption	496	Moscow "Internet Engineering"
Shubov L.Y., Stavrovsky M.E, Oleynik A.V	2011	Waste technology	352	Moscow INFRA-M, Alpha-M
Golubev O.V., Chernousov P.I., Travyanov A.Y.	2005	Metallurgical methods industrial and household waste. Part 1. Education and the problem processing of municipal solid waste.	79	Moscow Publ MIS and S
Golubev O.V., Chernousov P.I.	2005	Metallurgical methods industrial and household waste. Part 2. Special types of solid waste.	83	Moscow Publ MIS and S
Vinokourov V.D., Kozlov N.V.	2008	Disposal of waste production	60	Moscow Publ MGTU. N.E .Bauman
Smetanin V.I.	2000	Protecting the environment from production and consumption waste	232	Moscow Publ: Kolos
Shubov L.Y.	2008	Test training for study of technological processes enrichment and processing of solid waste. Practicum.	132	Moscow Publ MIS and S

Hwang T.A., Shinkina M.V.	2015	Ecological bases of nature.	320	Moscow Publishing: "Yurayt"
Jesse Russell	2012	Waste recycling	118	Publ: Book on demand
Further literature				
Tetior A.N.	2013	Ecology of urban environment	352	Moscow Publishing: «Academia
Zhitkov V., Voronina I., O. Kalacheva	2012	Environmental protection in Russia. 2012	304	Moscow Publ: Rosstat
Golik.V.I., Shevchenko, E.V., Komaschenko V.I., ets.	2012	Rationalization of natural resources in the development strategy of industrial enterprises	384	Moscow Publishing: "Academic Project, Culture"
Nikolaev S.N.	2002	Theory and methods of environmental education of children	336	Moscow Publishing: «Academia
Andreeva N.D., Solomin V.P., Vasilyeva T.V.	2009	Theory and methods of teaching ecology	203	Moscow Publishing: «Academia