MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION

Federal State Autonomous Education “Ural Federal University named after the first President of Russia B.N. Yeltsin”

Institute of Construction and Architecture

Signed and Approved

Vice-rector for Research

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ V.V. Kruzhaev

«\_\_\_» \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2018 г.

COURSE PROGRAM

**SPECIAL ISSUES OF CLOSED SYSTEMS ESTABLISHMENT AT INDUSTRIAL ENTERPRISES**

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| **Information about the course program** | **Accounting data** |
| **Education program**  The main education doctoral graduate program | **Specialty code**  08.06.01/09.11 |
| **Major**  Engineering and Construction Technologies | **Training program code**  08.06.01 |
| **Training program**  Water supply, sewerage, engineering of water resources protection systems |
| **Level of training** - Researcher. Research teacher |
| **Federal State Educational Standard** | **The Ministry of Education and Science of the Russian Federation approval FSES HE order details:**  July 30, 2014 No. 873  (revised April 30, 2015) |

**Ekaterinburg**

**2017**

1. **GENERAL CHARACTERISTIC OF THE course**

**SPECIAL ISSUES OF CLOSED SYSTEMS ESTABLISHMENT AT INDUSTRIAL ENTERPRISES**

* 1. **Abstract of the course content**

This course is the elective one. The main goal of the course is to prepare graduate students in the field of industrial wastewater treatment with treated waste (sediments, concentrates, purge water) on tail-placed waste water treatment unit to create closed systems of water management at industrial enterprises. The tasks of the course are: the participation of graduate students in research, design, production, technological and operational activities in the field of closed water management systems of industrial enterprises of various sectors of the national economy.

             Knowledge gained by this course is used in the study of the " Water supply, sewerage, engineering of water resources protection systems " course.

**1.3. Planned learning outcomes**

After mastering this course, the graduate student must acquire the following competencies:

Universal competencies (UC):

* the ability to critically analyze and evaluate current scientific achievements, generate new ideas in solving research and practical problems, also in the interdisciplinary fields (UC-1);
* the ability to follow ethical standards in professional activities (UC-5);
* ability to plan and solve the tasks of their own professional and personal development (UC-6);

 General professional competencies (GPC):

* possession of the methodology of theoretical and experimental research in the field of construction (GPC -1);
* knowledge of the culture of scientific research in the field of construction, including the use of the latest information and communication technologies (GPC -2);
* ability to professional exploitation of modern research equipment and instruments (GPC -4);
* the ability to present the results of their research professionally in the form of scientific publications and presentations (GPC -5);
* readiness to teach in basic educational programs (GPC -8);

 Professional competencies (PC):

* the ability to analyze and synthesize engineering structures, technologies and structures, develop new ones and develop existing methods for calculating and optimizing them (PC-2).

As a result of mastering the discipline, the student must to:

**Know:** modern and promising technologies in the field of water management of industrial enterprises in order to create closed systems; modern and promising facilities and equipment for the treatment and conditioning of industrial wastewater and the resulting (waste) sediments;

**To be able to**: independently choose the necessary technologies and equipment for the effective treatment of industrial wastewater using the necessary tailings in closed systems of water management of industrial enterprises; assess the quality of decisions made, including taking into account economic criteria;

**To have:** the skills of choosing the best technological solutions and the calculation of processes, devices and structures during the treatment and conditioning of industrial wastewater and the resulting precipitation using tailing facilities when creating closed water management systems of industrial enterprises.

**2. COURSE CONTENTS**

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| **Code** | **Section, topic** | **Content** |
| **Р1** | The causes and history of the creation of closed water-carrying systems of industrial enterprises in domestic and foreign practice | The reasons for the need for industrial enterprises to switch to waste-free (low-waste) technologies; closed water management systems as an example of such a transition |
| ***Р2*** | Characteristics of closed water-carrying systems | Composition of closed systems of water management: main treatment facilities, tailing facilities |
| ***Р3*** | The practice of operating closed water-carrying systems of industrial enterprises | Work with complex equipment; using  recycled water of high salinity; treatment of the resulting sediments and their disposal |
| ***P4*** | Development prospects  closed water-carrying systems | Work to reduce the cost of the complex closed systems of water management. Curbing the growth of industrial water consumption |

**4 BASE OF TASKS FOR INDEPENDENT WORK**

**4.3.1. Sample homework topics**

Planned four homework (one work for each section of the discipline):

1) “Justification of the need to transfer industrial enterprises to low-waste technologies”;

2) “Conditions for selecting tail installations of water-carrying systems for enterprises of various industries”

3) "The practice of operating closed water-carrying systems on the example of domestic and foreign enterprises";

4) “Justification of the main directions in the development of closed systems of water management of industrial enterprises”

**4.3.3. Sample essay topics (essay, creative works)**

There are four essays planned (one essay for each section of the discipline):

1) "The history of the creation of closed water-carrying systems of industrial enterprises in domestic and foreign practice";

2) “Characteristics of closed water-carrying systems of industrial enterprises”;

3) "The practice of operating closed water-carrying systems of industrial enterprises";

4) "Prospects for the development of closed water-carrying systems of industrial enterprises"

**7 METHODICAL AND INFORMATION SUPPORT**

**7.4. Information and reference systems and search systems**

1. Search system «Google» (<https://www.google.ru/>). Free access from the Internet.
2. Search system «Scholar Google» (<https://scholar.google.ru/>). Free access from the Internet.
3. Electronic Scientific Archive of UrFU (<http://elar.urfu.ru/>). Free access from the Internet.
4. Scientific electronic library «eLIBRARY.ru» (<http://elibrary.ru/>). Free access from the Internet.
5. Scientific electronic library «CyberLeninka » (<http://cyberleninka.ru/>). Free access from the Internet.
6. Scopus reference database (http://www.scopus.com/). Free access from the UrFU corporate network.
7. The Abstract Database "Web of Science Core Collection" (http://apps.webofknowledge.com/). Free access from the UrFU corporate network.
8. Electronic library system “Lan” (http://e.lanbook.com/). Access: 1) free from the UrFU corporate network; 2) remote access via the Internet using logins and passwords. To obtain a login and password, you must register using any computer on the UrFU corporate network.
9. University Library Online Electronic Library System (http://biblioclub.ru/). Access: 1) free from the UrFU corporate network; 2) remote access via the Internet using logins and passwords. To obtain a login and password, you must register using any computer on the UrFU corporate network.
10. Electronic library system "Library Packer" (http://www.bibliocomplectator.ru). Access: 1) free from the UrFU corporate network; 2) remote access via the Internet using logins and passwords. To obtain a login and password, you must register using any computer on the UrFU corporate network.
11. Electronic databace Polpred.com (<http://polpred.com/>). Access: 1) free from the UrFU corporate network; 2) remote access via the Internet using logins and passwords. To obtain a login and password, you must register using any computer on the UrFU corporate network.
12. Professional reference system"TechExpert". Access from any computer of the UrFU corporate network via the link posted on the Internet site of the National Security Service of UrFU (<http://lib.urfu.ru/>)
13. Electronic library system «IPRbooks» (<http://www.bibliocomplectator.ru>) Access: 1) free from the UrFU corporate network; 2) remote access via the Internet using logins and passwords. To obtain a login and password, you must register using any computer on the UrFU corporate network.

**8 base of materials for current academic performance Evaluation and interim assessment**

**Sample questions for credit**

1. Gradual transition of industrial enterprises to low-waste technology;

creation of closed water-carrying systems of industrial enterprises as the first step in this direction

2. Technological basis for the creation of closed water-carrying systems - the development of “tail installations” for closed water-carrying systems: conditioning of circulating water, sludge treatment, development of management and automation tools

3. Comprehension of operating experience of closed water-carrying systems in domestic and foreign practice

4. Prospects for the development of closed water-carrying systems: cheaper technological processes, the introduction of new technology, the reconstruction of existing fixed assets

5. Simultaneous solution of global problems in industrial production: a decrease (and further complete stoppage) of the growth in industrial consumption of fresh water

6. Reduction (and further complete stoppage) of the growth of water pollution by industrial effluents

7. Development of a long-term (for 30-40 years) feasibility study of the development of water-carrying of industrial enterprises only through the creation of closed water-carrying systems

8. Work on the preparation of a full-fledged personnel potential for the creation of closed water-carrying systems of industrial enterprises