

The ministry of science and higher education of the Russian Federation
 Federal state autonomous educational institution of higher education
 «Ural Federal University named after the first President of Russia B. N. Yeltsin»
 Institute of Chemical Engineering

APPROVED

Vice-rector for Research

Germanenko



THE DISCIPLINE WORKING PROGRAM

Research practice

List of information about the working program of the discipline	Credentials
Doctoral program Technology of organic substances	Code DP 2.6.10
Group of specialties Chemical technologies, material sciences, metallurgy	Code 2.6
Federal state requirements (FSR)	Order of the Ministry of science and higher education of the Russian Federation of 20.10.2022 № 951
Independently approved requirements (IAR)	Order «On the introduction of «Requirements to the development and implementation of academic staff training programs in the UrFU doctoral course» of 31.03.2022 № 315/03

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The discipline working program is compiled by:

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Recommended by the educational and methodological board of the Institute of chemical engineering:

Chairman of the educational and methodological board

[A. B. Darintseva]

Report № 1 of 10.01.2023

Agreed by:

Head of academic staff training department

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1. DISCIPLINE DESCRIPTION

RESEARCH PRACTICE

1.1. Annotation of the discipline content

The discipline aim is to consolidate and advance doctoral students' theoretical knowledge acquired during the studying of subjects, as well as acquiring research skills.

The research practice of doctoral students with a «Chemical engineering» major and «Technology of organic substances» specialization is one of the main forms of the educational process aimed at the formation and education of highly qualified specialists in the field of organic chemistry. The content of the research practice of a doctoral student is determined based on the interests and capabilities of the department where the practice is carried out and is completely defined by an individual task. The list of topics that doctoral students study and perform in practice, their detail and depth of study, as well as the nature of individual tasks are defined by the head of practice.

The main objectives of the research practice are:

- studying the research basics,
- development of practical skills and scientific skills,
- improvement of motivation for scientific work,
- familiarization of doctoral students with the specifics of research in the field of organic chemistry,
- formation of skills to perform the functions of a researcher,
- consolidation of scientific and methodological knowledge in the field of technology of organic substances,
- acquisition of skills in a creative approach to solving scientific and production tasks.

1.2. The language of the discipline – Russian.

1.3. Expected discipline learning outcomes

As a result of mastering the discipline, a doctoral student should:

Know:

- basics of the scientific activity and informational security organization;
- legal and regulatory frameworks of research;
- methods of the quality evaluation of research and publications.

Be able to:

- carry out research focused on the preparation and getting of scientific grants and awarding the research contracts in the field of the technology of organic substances;
- present thesis results as publications in peer-reviewed journals and scientific conferences presentations;
- review and edit scientific articles;
- perform critical analysis and the evaluation of modern scientific advances;
- generate new ideas when solving research and practical problems, including interdisciplinary areas.

Demonstrate:

- skills in using laboratory and instrumental base for acquiring research data;

- skills of carrying out research and acquiring research results that meet the established requirements for the content of a doctoral thesis.

1.4. Discipline load

#	Types of educational work	Discipline load		Discipline load distribution in the 2 nd semester (hours)
		Total hours	Including work with a lecturer (hours)*	
1.	Independent work of doctoral students including all types of continuous assessments	108	0	108
2.	Midterm assessment	108		C
3.	Total load of curriculum, hours	108		108
4.	Total load of curriculum, credit points	3		3

* Work with a lecturer includes:

in #2, 3 – the number of hours equal to the corresponding type of work;

in #4 – the number of hours equal to the time devoted by a lecturer to the meeting with the group (15% of the load of classwork).

In #5 – the number of hours equal to the time devoted by a lecturer to perform the corresponding type of midterm assessment of a doctoral student.

2. DISCIPLINE CONTENT

Section code, topic	Section, discipline topic	Content
S1	Organizational aspects of research	Familiarization with the organization of research in the Russian Federation, in the education system of the Russian Federation, and in UrFU. Familiarization with the research directions of the graduating department, leading professors, and associate professors of the departments of the Institute of chemical engineering. Familiarization with the history of the formation of the research directions of the graduating department, and other departments of the Institute of chemical engineering. Studying the literature on the problems of scientific creativity. Design of the individual plan of the research practice.
S2	Scientific writing and speaking	Study of methods for organization of scientific speaking for scientific seminars, conferences, etc. Study of methods of organization of scientific writing for presenting research results in the form of reports, articles, abstracts, presentations, monographs, popular science texts, etc. Study of methods for developing

		scenarios for conducting scientific teleconferences and other innovative forms of scientific knowledge exchange. Participation in scientific seminars.
S3	Practical aspects of research	Familiarization with legal and regulatory frameworks of scientific activity. Familiarization with various methods of quality evaluation of research and scientific publications. The analysis of local and foreign practices of training researchers in the field of organic chemistry. Familiarization with the teaching practices of various departments of the Institute of Chemical Engineering. Familiarization with the University's scientific equipment for conducting research in the field of technology of organic substances. The study of methods for preparing and conducting scientific research and experiments in the field of the technology of organic substances using innovative technologies. Attendance of scientific and methodological meetings. Preparation of the final report on research practice.

3. ORGANIZATION OF PRACTICE AND INDEPENDENT WORK IN THE DISCIPLINE.

3.1. Estimated plan of independent work

List of tasks for independent work	Workload	
	hour	credit points
Organization of research in the Russian Federation, in the education system of the Russian Federation, and in UrFU	4	
Research directions of the graduating department, leading professors, and associate professors of the departments of the Institute of chemical engineering	4	
The history of the formation of the research directions of the graduating department, and other departments of the Institute of chemical engineering	4	
Studying the literature on the problems of scientific creativity	3	
Design of the individual plan of the research practice	3	
Study of methods for organization of scientific speaking for scientific seminars, conferences, etc.	4	
Study of methods of organization of scientific writing for presenting research results in the form of reports, articles, abstracts, presentations, monographs, popular science texts, etc.	10	
Study of methods for developing scenarios for conducting scientific teleconferences and other innovative forms of scientific knowledge exchange	6	
Participation in scientific seminars	16	
Legal and regulatory frameworks of scientific activity	6	
Methods of quality evaluation of research and scientific publications	4	

The analysis of local and foreign practices of training researchers in the field of organic chemistry	6	
Familiarization with the teaching practices of various departments of the Institute of Chemical Engineering	4	
Familiarization with the University's scientific equipment for conducting research in the field of technology of organic substances	12	
Methods for preparing and conducting scientific research and experiments in the field of the technology of organic substances using innovative technologies	10	
Attendance of scientific and methodological meetings	6	
Preparation of the final report on research practice	6	
TOTAL	108	3

4. THE SET OF TOOLS FOR CONTINUOUS AND MIDTERM DISCIPLINE ASSESSMENT (Appendix 1)

4.1. The evaluation criteria for the results of the control test activities of continuous and midterm doctoral research assessment

Applied evaluation criteria of the achievements of doctoral students for each control test activity were approved by the Institute of chemical engineering. The evaluation criteria system is based on three levels of mastering the competence components: intermediate, advanced, high.

Competence components	Indications of the level of competence components acquisition		
	intermediate	advanced	high
Knowledge	The doctoral student demonstrates knowledge-familiarity, and knowledge-copy: recognizes objects, phenomena, and concepts, finds differences between them, shows knowledge of the information sources, and can independently perform reproductive actions on knowledge by independently reproducing and applying information.	The doctoral student demonstrates analytical knowledge: confidently reproduces and understands the acquired knowledge, assigns it to one or another classification group, independently systematizes it, establishes relationships between them, and applies it productively in familiar situations.	The doctoral student is able to independently extract new knowledge from the world, and creatively apply it for problem-solving in new and non-standard situations.
Skills	The doctoral student is able to correctly follow prescribed instructions and algorithms in a familiar situation, and	The doctoral student is able to independently perform actions (techniques, and operations) to solve non-	The doctoral student is able to independently solve research problems and demonstrates the

	independently solves typical tasks that require choosing from known methods in a predictably changing situation.	standard tasks that require a choice based on a combination of known methods in an unpredictably changing situation.	creative application of skills (technologies).
Personality	The doctoral student has low motivation for learning, and shows an indifferent, irresponsible attitude to learning and assigned work.	The doctoral student demonstrates high motivation to learning, shows a positive attitude towards study and the future career, and demonstrates activity.	The doctoral student demonstrates strong motivation to learning and work, and shows persistency, enthusiasm, diligence, independence, and creativity.

4.2. The tools for continuous and midterm assessments

The final document is a written report of the doctoral student, that should include the sections in accordance with the practice program, and a presentation of practice results at the department meeting in the form of a report.

In the report, the doctoral student should provide the results of the research and experiments conducted with the personal participation of the student. The “confidential” and “restricted” classification levels could be granted to certain report sections where it is necessary. The doctoral student should not include classified information in the final report. In the case of practice in research organizations or enterprises, the head of the organization (enterprise) evaluates the quality of the report and provides a review of the doctoral student's work. The signature of the company's practice supervisor in the final report should be verified by a stamp of the HR department of the company.

The doctoral student's final assessment on the basis of the practice results is carried out by the department where the student had research practice, based on a review submitted by the head of the practice. The main basis for the passing of a student is the active participation of a doctoral student in the work of scientific seminars on the topic relevant to the student's research work.

The doctoral student who failed the practice program or received an unsatisfactory mark on the report presentation will be assigned to a repetitive practice during holiday time.

5. EDUCATIONAL, METHODOLOGICAL, AND INFORMATIONAL SUPPORT OF THE DISCIPLINE

5.1. Recommended literature

5.1.1. Main literature

1. Booth, W. C.; Colomb, G. G.; Williams, J. M.; Bizup, J.; Fitzgerald, W. T. *The Craft of Research*. 4 ed.; University of Chicago Press: 2016; p 336.
2. Thomas, G. *How to Do Your Research Project: A Guide for Students*. 4 ed.; SAGE Publications Ltd: 2022; p 368.
3. Silvia, P. J. *How to Write a Lot: A Practical Guide to Productive Academic Writing*. 2 ed.; American Psychological Association: 2018; p 110.
4. Bright Wilson Jr., E. *An Introduction to Scientific Research*. Dover Publications: 1991; p 400.
5. Dunleavy, P. *Authoring a PhD: How to Plan, Draft, Write and Finish a Doctoral Thesis or Dissertation*. Red Globe Press: 2003; p 297.
6. Schimel, J. *Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded*. Oxford University Press: 2011; p 221.
7. McCarthy, P.; Hatcher, C. *Presentation Skills: The Essential Guide for Students (Study Skills)*. 1 ed.; SAGE Publications Ltd: 2002; p 228.
8. Morgan, S.; Whitener, B. *Speaking about Science: A Manual for Creating Clear Presentations* 1ed.; Cambridge University Press: 2006; p 138.

5.1.2. Additional literature

1. Creswell, J. W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 2 ed.; SAGE Publications, Inc: 2002; p 272.
2. Bell, J. *Doing Your Research Project (Open Up Study Skills)*. 5 ed.; Open University Press: 2010; p 296.
3. Christensen, L.; Johnson, R.; Turner, L. *Research Methods, Design, and Analysis*. 12 ed.; Pearson: 2014; p 552.

5.2. Institute teaching and learning materials

Not provided

5.3. Software

1. Microsoft office (Word, Excel, Power point)
2. Adobe Reader
3. ChemOffice (ChemDraw Professional)
4. ISIS/Draw
5. CorelDraw X5
6. Mercury
7. Olex2
8. OriginLab

9. Mathcad 2014

5.4. Databases, information reference, and search systems

1. ScienceDirect <https://www.sciencedirect.com/>
2. Web of Science <https://www.webofknowledge.com>
3. Scopus: <http://www.scopus.com>
4. SeiFinder: <http://www.scifinder.com>
5. Reaxys: <http://reaxys.org>
6. Academic Search Ultimate EBSCO publishing <http://search.ebscohost.com>
7. Federal Institute of Industrial Property <https://www1.fips.ru/en/>
8. Search system Google Search <https://www.google.com/>

5.5. Electronic learning sources

1. Zonal scientific library <http://lib.urfu.ru/course/view.php?id=167>
2. UrFU electronic resources <http://lib.urfu.ru/mod/data/view.php?id=2802>
3. Library catalogue <http://lib.urfu.ru/course/view.php?id=181>

6. LOGISTIC DISCIPLINE SUPPORT

6.1. Details on the specialized and laboratory equipment availability

Ural Federal University has specialized premises for lectures, group and individual meetings, continuous and midterm assessments, independent work premises equipped with computers having Internet access and providing access to the university electronic information educational environment as well as premises for equipment storage and preventive maintenance. Doctoral students have access to specialized premises for research work.