



MINISTRY OF EDUCATION AND SCIENCE OF RUSSIA  
FSBEI HE "Chelyabinsk State University"

**Faculty of Mathematics**  
**Department of Mathematical Analysis**

Scientific component program 1.1(S) "Scientific (research) activities aimed at preparation of the thesis defence"  
1.2(S) "Preparation of articles and (or) patents applications"  
Scientific specialty – 1.1.2. Differential equations and mathematical physics  
Direction - Differential equations and mathematical physics



**APPROVED**

Vice-rector for Scientific Affairs

A.I. Biryukov

« 24 » 06 '2025

### **SCIENTIFIC COMPONENT PROGRAM\***

**1.1(S) "Scientific (research) activities aimed at preparation of the thesis defence"**

**1.2(S) "Preparation of articles and (or) patents applications"**

**Scientific specialty – 1.1.2. Differential equations and mathematical physics**

**Direction - Differential equations and mathematical physics**

Higher education – training of highly qualified personnel

Mode of study: Full-time

Chelyabinsk, 2025

\* The work program of the course (module) is adapted for inclusive education of disabled people and people with disabilities



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Direction - Differential equations and mathematical physics

The program "Scientific (research) activities aimed at preparation of the thesis defence" and "Preparation of articles and (or) patents applications" is compiled for the scientific specialty 1.1.2. Differential equations and mathematical physics in accordance with federal state requirements (level of education: higher education - training of highly qualified personnel), approved by order of the Ministry of Science and Higher Education of the Russian Federation dated October 20, 2021 No. 951.

Program developers:

Head of the Department of Mathematical Analysis  
Doctor of Physical and Mathematical Sciences,  
Professor

V.E. Fedorov

The program was approved at the meeting of the Department of Mathematical Analysis on January 24, 2025, protocol No. 7.

The program was approved at the meeting of the Academic Council of the Faculty of Mathematics on January 30, 2025, protocol No. 5.

**APPROVED**

Dean of the Faculty of Mathematics

E.A. Sbrodova

Head of the Department of  
Mathematical Analysis

V.E. Fedorov

Head of the Department of  
Postgraduate and Doctoral Studies

N.V. Bochkareva

Head of the Department of  
International Cooperation

N.R. Arnautova



**Abstract of the program:** scientific (research) activity aimed at preparing a dissertation for defense is a mandatory component of the program for training highly qualified personnel. The tasks provided by the program are aimed at forming a system of methodological knowledge, professional skills in scientific activity, ensuring independent conduct of research work on the topic of the dissertation. An individual task for each postgraduate student is compiled taking into account his/her characteristics and needs within each year of study and is approved by the individual plan of scientific activity of the postgraduate student.

## **1. Objectives and tasks of conducting scientific research**

### **1.1(S) «Scientific (research) activities aimed at preparation of the thesis defence»**

#### **Objectives:**

- solving scientific problems that are important for development in the field of differential equations and mathematical physics;
- acquiring skills in conducting scientific research;
- mastering theoretical and experimental research methods, creating new methods in research;
- conducting scientific research based on deep professional research and writing dissertations for the scientific degree of candidate of sciences.

#### **Tasks:**

- ensuring the development of professional scientific research thinking, the formation of a clear understanding of the main professional tasks and ways to solve them;
- practical mastery of methods (techniques) for conducting research, in accordance with the chosen topic of scientific research;
- development of skills:
  - use modern technologies for collecting information, processing and interpreting the obtained empirical data, mastery of modern research methods;
  - independent formulation and solution of problems arising in the course of scientific research activities and requiring in-depth professional knowledge;
  - development of the ability to:
    - critical analysis and evaluation of modern scientific achievements, generation of new ideas when solving research problems;



- design and implement complex research based on a holistic systemic scientific worldview;
- development of readiness to participate in the work of Russian and international research teams to solve scientific and scientific-educational problems;
- development and improvement of personal qualities necessary in scientific research activities: the ability to plan and solve problems of one's own professional and personal development, the ability to follow ethical standards in professional activities.

### **1.2(S) "Preparation of articles and (or) patents applications"**

**Objective:** preparation and publication in print of the main scientific results of the dissertation.

#### **Tasks:**

- study of methodological approaches to the problem under study;
- mastering methods of searching and abstracting scientific literature, working with specialized sources of statistical data;
- development of skills for independent work with reference and legal information systems;
- formation of skills for setting goals and objectives of scientific research, developing a scientific hypothesis and choosing methods for solving them;
- acquiring skills for analyzing practical situations, assessing the effectiveness of existing legal regulation and the quality of its implementation in managing the organization's activities;
- using methodological and theoretical tools to achieve the goal and solve problems of scientific research;
- development of skills for preparing publications based on the results of scientific research; – improving the skills of publicly presenting the obtained scientific results and conducting scientific discussions.

## **2. The place of scientific (research) activity aimed at preparing a dissertation for defense in the structure of the program**

1.1.1(S) "The place of scientific (research) activity aimed at preparing a dissertation for defense in the structure of the program" is included in the scientific component and is mandatory. Research activities (SRA) and preparation



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of the dissertation are carried out throughout the entire period of study in accordance with the scientific specialty of the postgraduate program - 1.1.2. Differential equations and mathematical physics. Research work is carried out by students in the Department of Mathematical Analysis. The total workload of the scientific component is 219 credits/7884 hours, including scientific (research) activity - 190 credits/6840 hours, publication preparation - 21 credits/756 hours, midterm assessment at the stages of scientific research - 8 credits/288 hours, of which contact work on these types of activity with the scientific supervisor (teacher) – 2.7 credits/96 hours, independent work - 215.9 credits/7772 hours, control - 0.4 credits/16 hours.

To carry out research work, the student must have basic mathematical training and skills in modern methods of mathematical research. The student must have the skills to collect, process, analyze material, and also master the basic concepts of mathematical, complex and functional analysis, the theory of ordinary differential equations, mechanics within the framework of the university course for students-mathematicians.

**Requirements for the "input" knowledge, skills and experience of the student's activities, necessary for the performance of scientific (research) activities)**

<b>Know</b>	<b>Be able to</b>	<b>Possess</b>
<b>1.1(S) "Scientific (research) activities aimed at preparation of the system of defense"</b>		
basic methods of scientific research activities	identify and systematize the main ideas in scientific texts; critically evaluate any incoming information regardless of the source; avoid automatic application of standard formulas and techniques when solving problems	skills in collecting, processing, analyzing and systematizing information on the research topic; skills in selecting methods and means for solving research problems
main directions and problems in the field of history and philosophy of science, the content of modern philosophical discussions on the problems of social development	to formulate and argue one's own position on various problems of the history and philosophy of science; to use the provisions and categories of philosophy to evaluate and analyze various social trends, facts and phenomena	skills of perception and analysis of texts, methods of conducting discussions and polemics, skills of public speaking and written argumentative presentation of one's own point of view
goals and objectives of scientific research in the area of activity, basic principles and methods	draw up a general work plan on a given topic, propose research methods and ways of processing results, conduct	systematic knowledge in the area of activity; in-depth knowledge in the chosen area of training, basic



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of their organization; main sources of scientific information and requirements for the presentation of information materials	research according to a plan agreed upon with the supervisor, present the results obtained	skills in conducting research work on the proposed topic
skills of perception and analysis of texts, methods of conducting discussions and polemics, skills of public speaking and written argumentative presentation of one's own point of view	apply methods of mathematical analysis, differential equations and dynamic systems in solving problems of higher mathematics	skills in solving problems related to differential equations
<b>1.2(S) "Preparation of articles and (or) patents applications"</b>		
methods of critical analysis and evaluation of modern scientific achievements, methods of generating new ideas in solving research and practical problems, including in interdisciplinary areas, methods of scientific research activities	analyze alternative solutions to research and practical problems and evaluate potential gains/losses of implementing these options	skills in analyzing the main ideological and methodological problems, including those of an interdisciplinary nature, arising in science at the current stage of its development, and mastering the technologies of planning professional activities in the field of scientific research
types and features of written texts and oral presentations; understand the general content of complex texts on abstract and concrete topics, including highly specialized texts	select literature on the topic, compile a bilingual dictionary, translate and review specialized literature, prepare scientific reports and presentations based on the specialized literature read, explain your point of view and talk about your plans	skills in discussing a familiar topic, making important comments and answering questions; creating simple coherent text on topics that are familiar or of interest to him, adapting it to the target audience
possible areas and directions of professional self-realization; methods and technologies of goal setting and goal realization; ways of achieving higher levels	identify and formulate problems of one's own development, based on the stages of professional growth and the labor market requirements for a specialist; formulate goals of professional and personal development, assess one's	methods of goal setting, planning, implementation of necessary types of activities, assessment and self-assessment of the results of activities to solve professional problems; methods of identifying and realizing one's capabilities, personal and professionally



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of professional and personal development	capabilities, the realism and adequacy of the planned methods and ways of achieving the planned goals	significant qualities with the aim of improving them
fundamental principles of differential equations, dynamic systems and optimal control	apply methods of mathematical analysis, differential equations and dynamic systems in solving problems of higher mathematics	skills in solving problems related to differential equations

### 3. Requirements for the results of scientific (research) activities and preparation of publications:

<b>Results of training in scientific research activities</b>	
<b>1.1(S) "Scientific (research) activities aimed at preparation of the system of defense"</b>	
know	methods of critical analysis and evaluation of modern scientific achievements, as well as methods of generating new ideas in solving research and practical problems, including in interdisciplinary areas methods of scientific research activities
be able to	analyze alternative solutions to research and practical problems and evaluate potential gains/losses of implementing these options when solving research and practical problems, generate new ideas that can be operationalized based on available resources and limitations
possess	skills in analyzing methodological problems arising in solving research and practical problems, including in interdisciplinary areas skills of critical analysis and evaluation of modern scientific achievements and results of activities in solving research and practical problems, including in interdisciplinary areas planning technologies in professional activities in the field of scientific research
<b>1.2(S) "Preparation of articles and (or) patents applications"</b>	
know	modern ways of using information and communication technologies in the chosen field of activity
be able to	follow the standards accepted in scientific communication when working in Russian and international research teams in order to solve scientific and scientific-educational problems develop and apply methods of modern differential equations, dynamic systems and optimal control to solve problems skills in setting problems related to differential equations
possess	skills in analyzing the main ideological and methodological problems, including those of an interdisciplinary nature, arising when working to solve scientific and scientific-educational problems in Russian or international research teams



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	technologies for planning activities within the framework of work in Russian and international teams to solve scientific and scientific-educational problems
	various methods, technologies and types of communications in the implementation of professional activities in the state and foreign languages

#### 4. The content and structure of scientific (research) activities aimed at preparing a dissertation for defense, and preparing publications

##### 4.1. The structure of scientific (research) activities aimed at preparing a dissertation for defense

The total workload of the scientific component is 219 credits/7884 hours, including scientific (research) activity - 190 credits/6840 hours, publication preparation - 21 credits/756 hours, midterm assessment at the stages of scientific research - 8 credits/288 hours. Form of control - credit with assessment (differentiated credit) (1-8 semesters).

##### The structure of scientific (research) activities aimed at preparing a dissertation for defense and preparing publications

№	Stage name	Total (hours)	Contact work (hours per postgraduate student)	Self-study (hours)
<b>Scientific (research) activity aimed at preparing a dissertation for defense</b>				
1.	Preparatory	900		900
2.	Preliminary	756		756
3.	Main	900		900
4.	Main	720		720
5.	Main	900		900
6.	Main	972		972
7.	Completive	972		972
8.	Final	720		720
<b>Preparation of publications that present the main scientific results of the dissertation</b>				
№	Stage name	Total (hours)	Contact work (hours per postgraduate student)	Self-study (hours)
1.	Preparatory	72	12	60
2.	Preliminary	72	12	60
3.	Main	144	12	132
4.	Main	144	12	132
5.	Main	72	12	60



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6.	Main	72	12	60
7.	Completive	72	12	60
8.	Final	108	12	96
<b>Interim assessment</b>				
1.	Scientific (research) activity: stage 1	36	2	34
2.	Scientific (research) activity: stage 2	36	2	34
3.	Scientific (research) activity: stage 3	36	2	34
4.	Scientific (research) activity: stage 4	36	2	34
5.	Scientific (research) activity: stage 5	36	2	34
6.	Scientific (research) activity: stage 6	36	2	34
7.	Scientific (research) activity: stage 7	36	2	34
8.	Scientific (research) activity: stage 8	36	2	34

#### 4.2. Content of SRA

№	Name of the SRA stage	Stage Content
1	Preparatory	Briefing on general issues. Defining the topic of a dissertation for a candidate of science degree. Drawing up a work plan. Justifying the relevance of the research topic. Drawing up a working version of the dissertation structure. Publication of report abstracts, preparation of articles for publication. Participation in scientific and practical seminars, conferences, congresses. Familiarization with the main results obtained to date within the framework of the selected research topic. Critical analysis of scientific literature. Generalization of literary information, compilation of a primary list of references. Preparation of a presentation based on the results of the literature review. Preparation of a report and speech at a scientific conference. Midterm assessment: semester report at the department.
2	Preliminary	Familiarization with the main methods of solving problems developed to date within the framework of the selected scientific topic. Acquiring skills in working with specialized equipment, including using specialized software.



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		Publication of abstracts of reports, preparation of articles for publication. Participation in scientific and practical seminars, conferences, congresses. Midterm assessment: report for the semester at the department.
3-6	Main	Conducting planned research; processing results, discussing results, formulating intermediate conclusions and adjusting further research plans. Testing the results obtained at scientific conferences (including international ones). Preparing and submitting applications for scientific grants (as part of a research team and independently under youth programs). Preparing results for publication/patents (certificates). Publication in peer-reviewed journals (including in a foreign language). Midterm assessment: semester report at the department.
7	Completive	Preparing the results for publication. Publication of the work in peer-reviewed journals (including in a foreign language). Participation in scientific conferences (including international ones) for the purpose of testing the work. Experience in the practical implementation of the work results. Registration of the work results. Preparation of individual sections and the text of the dissertation for the degree of candidate of sciences. Midterm assessment: report for the semester at the department.
8	Final	Preparation of the research report (draft of the candidate's thesis) and admission to the final certification. Submission of the dissertation to the graduating department for the appointment of reviewers and the date of preliminary consideration of the dissertation at a meeting of the department (pre-defense) in accordance with the Regulations on the final certification of graduate students. Conclusion on the readiness of the dissertation for defense. Final attestation in the form of an assessment of the dissertation for its compliance with the criteria established by the legislation of the Russian Federation The department where the dissertation was performed prepares the conclusion. The conclusion reflects the graduate student's personal involvement in obtaining the results set out in the dissertation, the degree of reliability of the results of the research conducted by the graduate student, their novelty and practical significance, the value of the graduate student's scientific work, and the compliance of the dissertation with the requirements established in accordance with the Federal Law of August 23, 1996. No. 127-FZ "On Science and State scientific and Technical Policy", the scientific specialty (scientific specialties) and the branch of science to which the dissertation corresponds, the completeness of the presentation of the dissertation materials



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		in the works accepted for publication and (or) published by the graduate student.
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## 5. Educational technologies

The following modern educational technologies are used in the implementation of scientific research work:

- information and communication technologies;
- research methods in teaching.

In accordance with the approved main educational program for the scientific specialty 1.1.2. Differential equations and mathematical physics (focus (profile) - Differential equations and mathematical physics), scientific research work forms and develops professional skills in students. The effectiveness of the use of interactive forms of training is ensured by the implementation of the following conditions:

- creation of a dialogic space in the organization of the educational process;
- use of the principles of social and psychological training in educational and scientific activities;
- formation of psychological readiness of teachers to use interactive forms of training aimed at developing the internal activity of a graduate student and achieving a number of important educational goals: stimulation of motivation and interest in the field of sociology in general educational and professional terms; increasing the level of activity and independence of scientific research work; development of skills of analysis, critical thinking, scientific communication.

The most effective educational technologies are the practice-oriented organization of research work and work according to a model provided by the supervisor, as well as conversation and joint analysis of the results of the graduate student's activities.

## 6. Assessment tools for ongoing monitoring of academic performance and midterm assessment

### 6.1. Passport of the fund of assessment tools for scientific (research activities) aimed at preparing a dissertation for defense

No	Controlled stages	Results	Name of the assessment tool
<b>Scientific (research) activity aimed at preparing a dissertation for defense</b>			
1	Preparatory	<b>know:</b> methods of critical analysis and evaluation of modern scientific achievements,	Report, graded credit



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		<p>as well as methods of generating new ideas when solving research and practical problems, including in interdisciplinary areas</p> <p><b>be able to:</b> analyze alternative solutions to research and practical problems and evaluate potential gains/losses from implementing these options</p> <p><b>possess:</b> skills in analyzing methodological problems arising in solving research and practical problems, including in interdisciplinary areas</p>	
2	Preliminary	<p><b>know:</b> methods of scientific research</p> <p><b>be able to:</b> when solving research and practical problems, generate new ideas that can be operationalized based on available resources and limitations</p> <p><b>possess:</b> skills of critical analysis and evaluation of modern scientific achievements and results of activities in solving research and practical problems, including in interdisciplinary areas</p>	collection and analysis of material, graded credit
3-6	Main	<p><b>know:</b> methods of scientific research</p>	research paper, graded credit



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		<p><b>be able to:</b> use the provisions and categories of the philosophy of science to analyze and evaluate various facts and phenomena</p> <p><b>possess:</b> skills in analyzing the main ideological and methodological problems, including those of an interdisciplinary nature, arising in science at the current stage of its development</p>	
7	Completive	<p><b>know:</b> methods of scientific research</p> <p><b>be able to:</b> use the provisions and categories of the philosophy of science to analyze and evaluate various facts and phenomena</p> <p><b>possess:</b> planning technologies in professional activities in the field of scientific research</p>	research paper, graded credit
8	Final	<p><b>know:</b> methods of scientific research</p> <p><b>be able to:</b> follow the standards accepted in scientific communication when working in Russian and international research teams in order to solve scientific and scientific-educational problems</p> <p><b>possess:</b> planning technologies in</p>	report, graded credit, presentation of dissertation



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		professional activities in the field of scientific research	
<b>Preparation of publications that present the main scientific results of the dissertation</b>			
1	Preparatory	<b>know:</b> modern ways of using information and communication technologies in the chosen field of activity <b>be able to:</b> develop and apply methods of modern differential equations, dynamic systems and optimal control to solve problems <b>possess:</b> skills in choosing methods for solving problems, including from related areas of mathematics	Report
2	Preliminary		collection and analysis of material
3-6	Main		research article
7	Compleitive		research article
8	Final		presentation of the dissertation

***Current control***

***Samples of assessment tools***

- **Report:** the main tool for both current and interim assessment of research, the topic corresponds to the scientific theme of the dissertation for the degree of candidate of physical and mathematical sciences; the form and methods of presentation (oral, written, presentation) to the place of its presentation: detailed - at conferences of various levels or a scientific seminar of the department; short - during the report on research.

- **Individual assignment:** must correspond to the area of research in the main educational program of postgraduate studies, focus (profile) - Differential equations and mathematical physics. The individual assignment is formulated by the scientific supervisor in accordance with the chosen topic of the dissertation and is aimed at studying existing and obtaining new results.

- **Checking the reporting documentation:** is carried out to assess the content and correctness of the design, and allows one to judge the level of organization and independence of the graduate student.

When writing a research report, the following formatting rules must be followed:



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The internship report is formatted on A4 sheets. The content is presented correctly, clearly and logically. The work is done in typewriting, observing the margins: left - 25 mm, right - 10 mm, top - 20 mm, bottom - 20 mm. Font - Times New Roman, font size - 14, line spacing - 1.5. The total volume of the internship report is from 5 to 10 pages. All pages are numbered, starting with the title page (the page number is not indicated on it), in Arabic numerals at the bottom, centered. Each section of the report begins on a new page. The headings of structural elements are printed in capital letters and located in the center of the page. There are no periods at the end of the headings, the headings are not underlined. Word hyphenation is not allowed in all headings. The distance between the section title and the subsequent text should be equal to 1 interval. The digital material is presented in the form of a table. Each table must have its own serial number and title. The table title is located in the center. The text must necessarily contain a reference to it, which can be formatted as follows: "... the results of this study are presented in Table 2" or "... the results of this study (see Table 2) showed that ...". Along with the material presented in the form of tables, for greater clarity, the data can be presented in the form of figures. The numbering of figures (as well as tables) is allowed throughout the report, as well as separately by sections. For example, Fig. 1.4. (First section, fourth figure). But it is necessary to remember that the report must use the same principle of numbering tables and figures. The title of the figure, unlike the title of the table, is placed under the figure in the center.

References to literature should be formatted in square brackets, indicating the source number in the list of references and the page, for example: [4, p. 28]; The report must be neatly formatted and fastened. Samples of the design of the title page of the research report and individual assignments are in the RPD and stored at the department.

The materials provided by the postgraduate student are assessed in accordance with the criteria for specific types of reports (abstract review, research article, experiment, collection and analysis of material, etc.):

- Justification of the relevance of the topic selection and formulation of the general research problem.
- Presentation based on the results of the literature review.
- Bibliography on the research topic.
- Object, subject, purpose and objectives of the research, research plan.
- Report at a scientific seminar.
- Participation in conferences on the research topic.
- Grant applications.
- Publications on the intermediate results of the research.



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### Expert assessment of completed works.

It is used in the assessment of intermediate and final results and conclusions of the study and represents a comparison of the results obtained by the dissertation candidate with the general state of the scientific research field.

### Midterm assessment

Form of the test:

The test is conducted in the form of a defense of the dissertation candidate's report, during which the supervisor identifies the degree of formation of knowledge, skills, possessions, and experience of activity using the following methods:

- analysis of the provided materials;
- a conversation on the learned material and research approaches;
- identifying the degree of formation of research work skills.

Test with assessment (differentiated test) – defense of the postgraduate student's report on the results of scientific work at the department in which the research activity is conducted.

### POSTGRADUATE STUDENT'S REPORT

\_\_\_\_\_ (Full name is indicated)

\_\_\_\_\_ years of study, semester \* \_\_\_\_\_

(first, second, third...)

Scientific specialty	Code and name
Direction	Name
Form of study	(full-time, part-time)
Scientific Director	Surname, initials, academic degree, title
Individual plan	Approved (date)
<b>1. WORKING ON A DISSERTATION RESEARCH</b>	
<b>1.1. Approval by the Academic Council</b>	
Topic	
Date and number of the protocol (Academic Council)	
<b>1.2. Work carried out on dissertation research</b>	
Drawing up a dissertation plan	
Compiling a literature review on the topic of the dissertation	
Writing individual chapters, paragraphs	



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Conducting an experiment (if provided for in the plan)	
Processing the experimental results	
Formulation of the main conclusions and recommendations	
Registration of Acts of implementation in research practice	
Dissertation readiness level	
Discussion at the department meeting	
Preparation for preliminary defense (approximate time frame)	

**2. PARTICIPATION IN CONFERENCES**

<b>№</b>	<b>Conference name, location, organization</b>	<b>date of the event</b>	<b>conference status</b> (international, all-Russian, regional)	<b>participation</b> (in person/in absentia, with/without report, with/without public)

**PARTICIPATION IN A SCIENTIFIC SEMINAR**

<b>№</b>	<b>Seminar title, location</b>	<b>date of the event</b>	<b>participation</b> (with/without report)

**3. PARTICIPATION IN SCIENTIFIC COMPETITIONS**


**4. PUBLICATION of articles in WEB OF SCIENCE, SCOPUS (full bibliographic description)**


**5. PUBLICATION of articles in publications from the list of the higher attestation commission (full bibliographic description)**

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<b>6. PUBLICATION of articles in other publications (full bibliographic description)</b>	
<b>7. Additional information</b>	

The report was provided by a graduate student \_\_\_\_\_  
Full name signature

Scientific Director \_\_\_\_\_  
academic degree and rank, full name signature

Head of Department \_\_\_\_\_  
academic degree and rank, full name signature

\*The report is filled in for the current period of the academic year, detailing what has been accomplished;  
the semester is indicated in accordance with the curriculum;  
paragraphs 4-6 indicate publications prepared, accepted for publication, published;  
the report is submitted to the postgraduate and doctoral department with an extract from the minutes of the department meeting; the results of the certification are formalized by assigning a grade (differentiated credit).

### **6.3. Criteria for assessing the results of scientific (research) activities**



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**The assessment of learning outcomes is carried out on a five-point scale:**

"Excellent" (5 points) - for the complete completion of assignments.

"Good" (4 points) - for the correct approach with minor errors in reasoning and conducting classes.

"Satisfactory" (3 points) - for the correct approach with significant errors in preparing materials for classes.

"Unsatisfactory" (1-2 points) - for failure to complete the assignment, for conducting classes without justifying the solutions to the assignments at the board.

**Critical assessment of completed work.**

The materials provided by the graduate student are assessed in accordance with the criteria imposed on specific types of reports (abstract review, research article, experiment, collection and analysis of material, etc.)

**Expert assessment of completed work.**

It is used in assessing the intermediate and final results and conclusions of the study and is a comparison of the results obtained by the dissertation candidate with the general state of the research field.

Assessment tools for disabled people and people with disabilities are selected taking into account their individual psychophysical characteristics.

If necessary, disabled people and people with disabilities are given additional time to prepare an answer for an exam/test.

When conducting the procedure for assessing the learning outcomes of disabled people and people with disabilities, it is envisaged to use the technical means necessary for them in connection with their individual characteristics. These means can be provided by CSU or their own technical means can be used.

The procedure for assessing the learning outcomes of disabled people and people with limited health capabilities in a course (module) involves providing information in forms adapted to their health limitations and information perception:

For visually impaired people:

- in printed form in large print,
- in the form of an electronic document,



- in the form of an audio file,
- in printed form in Braille.

For hearing impaired people:

- in printed form,
- in the form of an electronic document.

For people with musculoskeletal disorders:

- in printed form,
- in the form of an electronic document,
- in the form of an audio file.

When conducting the procedure for assessing the learning outcomes of disabled people and people with limited health capabilities in a course (module), the following additional requirements are met depending on the individual characteristics of the students:

a) instructions on the procedure for conducting the assessment procedure are provided in an accessible form (orally, in written form, in written form in Braille, orally using the services of a sign language interpreter);

b) accessible form of providing assignments of assessment tools (in printed form, in printed form in large print, in printed form in Braille, in the form of an electronic document, assignments are read out by an assistant, assignments are provided using sign language interpretation);

c) accessible form of providing answers to assignments (written on paper, typing answers on a computer, written in Braille, using the services of an assistant, orally).

If necessary, for students with disabilities and disabled people, the procedure for assessing the learning outcomes in a course (module) can be carried out in several stages.

## **7. Educational and methodological support for research**

**Independent work** of postgraduate students is carried out in the form of studying individual theoretical issues on the proposed literature and independently solving problems with their subsequent analysis or discussion. During independent preparation, students are provided with access to databases and library collections and access to the Internet.

Independent work contributes to:

- deepening and expanding knowledge;
- developing interest in independent research activities;
- mastering the techniques of the process of cognition and developing cognitive abilities.



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Independent work of postgraduate students has the main goal of ensuring the quality of training of graduating specialists.

Educational and methodological materials for independent work of students: manuals for preparing a qualifying work.

Educational and methodological materials for independent work of disabled students and individuals with limited health capabilities are provided in forms adapted to their health limitations and information perception:

For visually impaired individuals:

- in printed form in large print,
- in the form of an electronic document,
- in the form of an audio file,
- in printed form in Braille.

For hearing impaired individuals:

- in printed form,
- in the form of an electronic document.

For individuals with musculoskeletal disorders:

- in printed form,
- in the form of an electronic document,
- in the form of an audio file.

### **Main literature**

1. \*\* Kharchenko, L. N. Pedagogical design: presentation / L. N. Kharchenko. – Moscow: Direct-Media, 2014. – 116 p. –URL: <https://biblioclub.ru/index.php?page=book&id=240804>.
2. \*\* Sultanova, L. F. Pedagogical design: educational and methodological manual / L. F. Sultanova, L. S. Skryabina, L. A. Mitakovich. - Ufa: BSPU named after M. Akmulla, 2015. - 95 p. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/72548>.
3. \*\* Tsibulnikova, V. E. Management of educational systems: educational and methodological complex of the course / V. E. Tsibulnikova; Moscow State Pedagogical University, Faculty of Pedagogy and Psychology, Department of Pedagogy and Psychology of Professional Education named after academician V.A. Slastenina. - Moscow: Moscow State Pedagogical University (MPGU), 2016. - 51 p.: ill.  
URL: <https://biblioclub.ru/index.php?page=book&id=469586>

### **Further reading**

1. Zagvyazinsky, V.I. Pedagogical creativity of the teacher. M., 2008. - 351 p.
2. Kolesnikova I.A. Pedagogical design: textbook. Manual for higher educational institutions /. M.: Publishing center "Academy", 2009. -288 p.



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3. Shamova T.I. Management of educational systems: Textbook. / T.I. Shamova, T.M. Davydenko, G.N. Shibanova - M.: Publishing center "Academy", 2008.

4. \*\* Tyunnikov, Yu. S. Design of innovative processes in vocational education: teaching aid / Yu. S. Tyunnikov, V.V. Krylova. - Sochi: SSU, 2018. - 50 p. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/147757>.

**Internet resources**

- eLIBRARY.RU [Electronic resource]: electronic library / Scientific electronic library – URL: <http://elibrary.ru/defaultx.asp>
- Lan [Electronic resource]: electronic library system (ELS) / Lan publishing house. – URL: <http://e.lanbook.com>
- University library online [Electronic resource]: electronic library system (ELS) / OOO Directmedia Publishing. – URL: <http://biblioclub.ru>

**Licensed software**

OpenOffice, Adobe Reader

**Electronic funds and resources**

The library website [www.lib.csu.ru](http://www.lib.csu.ru) is the means of access to the system of its own electronic resources. The electronic catalog provides a complete and prompt overview of the library collection, improves the quality and efficiency of information retrieval – more than 1.5 million records.

1. Electronic catalog. Bibliographic databases.

Books, electronic resources, dissertations and dissertations.

2. Electronic library.

Publications of Chelyabinsk State University, teaching and methodological complex; dissertations defended in the councils of Chelyabinsk State University, reserve collections, rare book collection, electronic reference book "Informio", statistical publications of Russia and the CIS countries.

3. Abstracts

Databases of INION RAS, VINITI databases, Scopus (<http://www.scopus.com>), Science (archive).

4. Full-text

Dissertation databases RSL, ARBICON, SIGLA, scientific electronic library <http://elibrary.ru>, subscription to the full-text collection of Russian scientific journals (2011-2015, 148 titles), publishers: Taylor&Francis, Sage Publications (archive of scientific journals); Springer, American Physical Society



(<http://www.journals.aps.org/about>), American Mathematical Society (<http://www.ams.org/mathscinet>), Wiley (<http://onlinelibrary.wiley.com>).

5. Electronic library systems with the ability to use licensed materials from anywhere with access to the Internet (registration from the university network of a personal account): University Library Online ([www.biblioclub.ru](http://www.biblioclub.ru)), Lan ([www.e.lanbook.com](http://www.e.lanbook.com)).

## 8. Logistics and technical support

To conduct research work envisaged by the curriculum for the preparation of postgraduate students, there is the necessary material and technical base that complies with current sanitary and fire safety rules and regulations, ensuring the implementation of all types of theoretical and practical training, as well as the effective completion of the final qualifying work (dissertation):

- lecture halls equipped with multimedia systems based on a vandal-proof tribune;
- specialized computer classes (laboratories) with peripheral devices and equipment connected to them;
- methodological materials for independent work (room 441a).

The Faculty of Mathematics has educational and research laboratories equipped with modern computers and multimedia systems: educational computing laboratory (2 computer classes, 24 computers), laboratory of optimization methods and modeling of game situations, educational and scientific laboratory of computer geometry, educational and scientific laboratory of differential equations and operator theory of the department of mathematical analysis, research laboratory of quantum topology, educational and scientific laboratory of technical teaching aids (10 computers), educational and scientific laboratory "Network polygon" (15 computers). All computers of the departments and laboratories of the Faculty of Mathematics are connected by a local network and have Internet access. The faculty has its own website [math.csu.ru](http://math.csu.ru), which contains educational and scientific materials developed by the faculty staff. Room for independent work (room 205, 206).

The University has computer rooms connected to a local network, Internet access, and equipped with modern high-performance computers. It maintains its own website: <http://csu.ru>.



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For obtaining higher education in postgraduate programs by disabled people and people with limited health capabilities, the University has classrooms equipped with the following equipment:

Room name	Equipment
Room for the typhlotechnical patient, room A-28 of the first academic building	Typhlotechnical aids: Braille computer with display and printer, typhlocomplex "Reading machine", television magnifying device, tiflocassette tape recorders (3 units) and digital voice recorders (6 units). Special software: speech navigation program JAWS, speech synthesizers ("talking mouse"), screen magnifiers.
Room for the deaf, room A-27 of the first academic building	radio class "Sonet-R" (for 6 people), programmable hearing aids (6 pcs.) for individual use with a device for setting the operating mode on a computer, audio equipment.
Adaptive Information Technologies Room, Room A-27, First Academic Building	Computer class for 2 people, interactive whiteboard ActiveBoard with voting system, acoustic amplifier and speakers, multimedia projector, TV, VCR, VCON HD3000 videoconferencing device.

All courses specified in this work program, methodological and technical support for the educational process for disabled people and people with limited health capabilities are provided by the Regional Educational and Scientific Center for Inclusive Education of CSU.

## **9. Methodological guidelines for students on the implementation of research activities and preparation of a dissertation**

The supervisor introduces the postgraduate student to the program (including the tasks and requirements for their implementation), the deadlines for research, the deadlines for submitting and the content of the reporting documentation, and the date of the report defense. Postgraduate students are admitted to the defense of their research reports by supervisors after they have been checked. The grades or credits are entered into the record books and records by supervisors.

The supervisors are responsible for the following duties:

1. Implementing direct supervision of research (introducing postgraduate students to the research program, conducting consultations, assisting in the



preparation of reporting documentation, providing the necessary methodological literature, etc.).

2. Monitoring the performance of individual assignments by postgraduate students.

Therefore, a postgraduate student must actively participate in lectures held during the training process, as well as complete the tasks of the supervisor in preparation for reports and essays

The variety of points of view and approaches presented in numerous textbooks on the issues under consideration complicates the learning process. There may be situations when materials on a specific topic are not reflected in existing textbooks, therefore, it is very important to actively interact with the supervisor when preparing the dissertation. Some topics in the specialized field can be difficult for independent study by graduate students, therefore, methodical revision of the material by the supervisor is necessary.

Given the existence of various concepts on individual topics, seminars are necessary for their objective coverage, for establishing a dialogue with young scientists so that they can develop the ability to correctly assess the processes that occur in modern society, in modern science.

It is advisable for a graduate student to actively participate in seminars, ask questions, since the ability to substantiate one's point of view, find a compromise solution in an ethically sound discussion is not only important for better assimilation of the material, but is also valued in real life. An important point in writing a dissertation is the organization of independent work.

### **Presentation of a scientific report on the main results of research activities in preparation of a dissertation**

This type of work promotes the skill of logical and methodological analysis of scientific research and its results:

1. Drawing up a dissertation plan;
2. Practicing the skill of writing an introduction as the main element of scientific work, reflecting its main provisions;
3. Practicing the skill of logical presentation of scientific text; practicing the skill of selecting and analyzing literature on the topic, which generally promotes the skill of analyzing and formulating scientific and cognitive situations and problems, as well as having experience in selecting means for solving them;
4. Writing a conclusion as practicing the skill of presenting the main findings of scientific research.
5. Practicing the skill of correctly formatting footnotes and a list of references, which is also necessary for further scientific work.



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Compiling a presentation for a scientific report as practicing the skill of competent and concise presentation of the research material presented in the dissertation.

The number of slides should be at least 5-6.

Defense of the project through a public speech for 5-7 minutes. This type of work demonstrates the development of self-presentation skills, the formation of "success behavior". This will allow you to model the main actions to defend your scientific position, which is extremely necessary in further scientific activity (presenting at conferences, public defense of a dissertation, etc.). This stimulates the need not only for knowledge of the world, but also for self-knowledge, for understanding your place in the world.



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## Change Registration Sheet

Change number	Sheet number			Date of change	Date of introduction of the change	Total sheets in document	Signature Of the person responsible for making changes
	changed	new	seized				