

Federal State Autonomous Educational Institution of Higher Education

**RUSSIAN PEOPLES FRIENDSHIP UNIVERSITY (RUDN)
ACADEMY OF ENGINEERING**

Recommended by ISSC
in the direction 08.06.01
"Engineering and construction technologies"

SCIENTIFIC RESEARCH PROGRAM

Recommended for the direction of training (specialty)
08.06.01 Engineering and construction technologies

Focus of the program (profile):

«Structural mechanics»

Qualification (degree) of the graduate: Researcher. Researcher-teacher

1. The **goal** of a postgraduate student's scientific research is to acquire practical skills in independent research work, to consolidate the theoretical knowledge gained during classroom, practical, laboratory and educational research classes, as well as to familiarize the graduate student with the social environment in order to acquire social and personal competencies, necessary for work in the professional field.

2. Objectives:

- familiarization with the program of research work of the organization (department, laboratory of the research institute, department, department) in which the practice is carried out;
- mastering modern methods and methodology of scientific research;
- improving the skills and abilities of independent research activities;
- accumulation of experience in scientific and analytical activities, as well as mastering the skills of presenting the results obtained in the form of reports, publications, reports.

In accordance with the types and tasks of professional activity, practice may include:

- study of installations, equipment, instruments, techniques and techniques of the experiment; theoretical and experimental research; processing, analysis and interpretation of experimental results;
- computer modeling of the studied processes and phenomena; obtaining scientifically significant results; preparation and analysis of literary sources necessary for writing a scientific report; preparation of the report and possible publications.

3. The place of research work in the structure of EP HE

The research program was developed on the basis of the federal state educational standard of higher education (higher education level - training of highly qualified personnel) in the direction of training 06/08/01 "Engineering and technology of construction" and is Block 3 "Research".

Scientific research in the system of training highly qualified personnel is a component of professional training for research activities in a higher educational institution and is a type of practical activity of graduate students in the implementation of scientific work, including research in the framework of their Ph.D. thesis, approbation of the results obtained and writing a thesis.

The implementation of scientific research is based on the knowledge, skills and competencies of the graduate student obtained in the study of the following disciplines:

- Research methodology;
- Research seminar;
- Building structures, buildings and structures / Building mechanics.

The knowledge, abilities and skills acquired by postgraduate students in the performance of scientific research are widely used in research activities, culminating in the writing of a thesis.

4. Forms of scientific research

Scientific research is carried out in the form of individual independent work under the guidance of a scientific advisor.

The forms of conducting can be:

- fulfillment of the tasks of the scientific supervisor in accordance with the approved plan of research work;
- participation in interdepartmental seminars, theoretical seminars (on research topics), as well as in the scientific work of the department;
- Speaking at conferences of young scientists held at RUDN University, in other universities, as well as participating in other scientific conferences and round tables;
- preparation and publication of theses of reports, scientific articles;
- participation in a real research project carried out in the department within the framework of budgetary and extrabudgetary research programs (or within the framework of the received grant).

The result of the work is the preparation and defense of a Ph.D. thesis.

5. Place and time of scientific research

Scientific research is carried out in the framework of the implementation of the curriculum for the preparation of graduate students in the direction 08.06.01 "Engineering and technology of construction."

Research forms - research work. The base of research practice is the laboratories of the construction department. In some cases, it can be carried out in the laboratories of industry research institutes and academic institutes (within the framework of an agreement on creative cooperation).

The methods of carrying out the practice are stationary practice, it is carried out continuously - by allocating a continuous period of study time in the calendar training schedule.

6. Competencies of the student, formed as a result of scientific research

The scientific research of the graduate student is aimed at the formation of the following universal, general professional and professional competencies:

Content of competence	Код компетенции
the ability to critically analyze and evaluate modern scientific achievements, generate new ideas when solving research and practical problems, including in interdisciplinary fields	GC-1
the ability to design and carry out complex research, including interdisciplinary, based on a holistic systemic scientific worldview using knowledge in the field of history and philosophy of science	GC-2
willingness to participate in the work of Russian and international research teams to solve scientific and scientific and educational problems	GC-3
readiness to use modern methods and technologies of scientific communication in the state and foreign languages	GC-4
the ability to follow ethical standards in professional activity	GC-5
the ability to plan and solve problems of one's own professional and personal development	GC-6
knowledge of the methodology of theoretical and experimental research in the field of professional activity	GPC-1
possession of the culture of scientific research, including using the latest information and communication technologies	GPC-2
the ability to comply with the norms of scientific ethics and copyright	GPC -3
the ability to professionally operate modern research equipment and instruments	GPC -4
the ability to professionally present the results of their research and present them in the form of scientific publications and presentations	GPC -5
the ability to develop new research methods and their application in independent research activities in the field of construction	GPC -6
willingness to organize the work of the research team in the field of construction	GPC -7
Professional competence "Structural mechanics (implemented in English)"	
possession of methods for the development of scientific and methodological foundations of research, improvement, theoretical, experimental and feasibility studies for the use of various	PC-1

technical solutions and technologies in construction	
possession of linear and nonlinear mechanics of structures and structures, physical and mathematical models, analytical and numerical methods of their calculation, including the calculation of structures and structures for reliability in extreme operating conditions	PC-2

As a result of scientific research, the student develops professional competencies and, based on the results of the practice, the graduate student must demonstrate the following results:

Have an idea:

- about the current state of science, the main directions of scientific research, priority tasks;
- on the procedure for introducing the results of scientific research and development.

Know:

- principles of operation of modern scientific equipment when conducting scientific research in their field;
- methods of searching for literary sources on the topic being developed with the aim of using them when performing a dissertation, patent search;
- research methods and experimental work;
- methods of analysis and processing of experimental data;
- information technology in scientific research, software products related to the professional sphere;
- requirements for the design of scientific and technical documentation.

Be able to:

- to formulate the goals and objectives of scientific research; choose and justify research methods;
- work on modern scientific equipment when conducting scientific research;
- to formalize the results of scientific research (report, scientific article, abstracts).

Have skills:

- work on modern scientific equipment during scientific research;
- work with applied scientific packages and editorial programs used in research and development;
- analysis, systematization and generalization of scientific and technical information on the topic of research;
- analysis of the reliability of the results obtained;
- analysis of the scientific and practical significance of the research, as well as the technical and economic efficiency of the development;
- presentations with reports and messages at conferences and scientific seminars.

7. Structure and content of scientific research

The base of scientific research is the laboratories of the Department of Civil Engineering. In some cases, they can be carried out in the laboratories of industry research institutes and academic institutes (within the framework of an agreement on creative cooperation).

In the process of performing scientific research, the postgraduate student continues to work on a single topic of research work of the departments, independently receiving experimental data. The topic of scientific research coincides with the topic of a future scientific report.

The scientific supervisor of the graduate student is appointed as the head of scientific research. The head carries out general organizational activities and current control over the progress of scientific research. If necessary, in addition to the scientific supervisor, a scientific consultant is appointed - a scientific employee who is in charge of the research facility, on which the graduate student will receive experimental results during the period of scientific research.

Before the start of scientific research, the head gives the graduate student an assignment, which indicates a section of a single research topic that is to be developed during the period of

scientific research; experimental technique; the amount of experimental data and the timing of each specific experiment; literary sources that need to be worked out by a graduate student during the period of scientific research.

The total workload of scientific research is 180 credit points 6480 hours.

№	Sections	Activities	Competency code	Labor intensity (credits)	Forms of control
1	Introduction	Safety briefings. Conversation with the supervisor: drawing up a research plan.	PC-1, GC-1	5	interview
2	Execution of experiments corresponding to the chosen profile of graduate school	Statement of the goal and objectives of the study. Review and analysis of information on the research topic. Conducting theoretical and experimental research.	PC-2, GPC-1	130	Interview. Monitoring results
3	Processing and presentation of the obtained results	Processing of experimental data, analysis of results. Preparation of a report and scientific publication.	PC-1,2,5, GPC-2,3,4,5,6,7 GC-2,3,4,5,6	40	Scientific publication report

8. Educational, research and development technologies used in scientific research

The main technologies used in the process of scientific research are:

- briefing; consultation;
- scientific and methodological work; workshop;
- independent work.

9. Educational and methodological support of independent work of graduate students

- multimedia equipment and personal computers;
- full-text databases and resources, access to which is provided from the RUDN University network;
- RFBR electronic library <http://elibrary.ru/defaultx.asp>.

The independent work of a postgraduate student is carried out in accordance with an individual plan developed together with a scientific advisor. The graduate student in his work uses sources on the topic of his scientific research. At the same time, the graduate student is obliged to familiarize himself with the works on the topic of his research, recommended to him by his supervisor.

10. Educational-methodical and informational support of scientific research

1. Shklyar M.F. Fundamentals of Scientific Research. M.: Publishing and trade corporation "Dashkov and K °", 2012. - 244 p.
2. Fundamentals of scientific research: textbook. allowance / B.I. Gerasimov et al. - M.: FORUM, 2011. - 269 p.
3. Denisov S.L. How to correctly draw up a dissertation and abstract: Method. allowance. - 2nd ed., Rev. and add. - M.: GEOTAR-Media, 2005. -- 85 p.

4. Kuzin F.A. Dissertation: Method of writing. Registration rules. Protection order: practical. manual for doctoral students, graduate students and masters / Kuzin F.A .; ed. Abramova V.A. –M .: Os-89, 2008. - 447 p.

5. Mareev S.N. Philosophy of Science. A textbook for graduate students and applicants. - From: Infra-M, 2015.

When passing research practice, graduate students use the basic and additional literature recommended by the scientific advisor.

- multimedia equipment and personal computers;
- full-text databases and resources, access to which is provided from the RUDN University network;
- electronic library RFBR
- scientific electronic library <http://elibrary.ru/defaultx.asp>.

11. Material and technical support of scientific research

1. Lecture halls with multimedia projectors; laboratories with equipment and instruments for laboratory work.
2. Scientific laboratories equipped with appropriate equipment.
3. Computers for calculating and processing results and access to information systems.

12. Interim certification forms

Control over the progress of scientific research is carried out by weekly consultations of a postgraduate student with a scientific advisor; verification by the scientific supervisor of the laboratory journal; speeches of graduate students on the subject of scientific research in the framework of a scientific seminar, speeches at scientific conferences; presentation of information on the progress of scientific research at the meetings of the department.

After completing scientific research, the graduate student writes a report that sets out all the results obtained in accordance with the assignment.

The results of scientific research are summarized by the graduate student in the report, which should contain: title page; introduction, which shows the relevance of the topic of scientific research; a literary review, compiled on the basis of the results of the study of literary sources, reflecting the known theoretical data and experimental results on the selected topic; conclusions; R&D list; experimental technique; discussion of the obtained results of the literature; table of contents.

The volume of the report is determined by the characteristics of the individual plan of the graduate student.

At the end of scientific research, the graduate student passes the test (defends the report) with a differentiated assessment at a conference in the presence of teachers and leading employees of the department. When evaluating the results of the work, the characteristics given by the head are taken into account.

When defending the report on the implementation of scientific research, the graduate student makes a report of no more than 10 minutes, in which he sets out the results obtained, gives their interpretation and reads out the conclusions. Then the graduate student answers questions on the topic of the work. A postgraduate student who has not completed the research program, received a negative review of the work or an unsatisfactory assessment when defending a report, is sent again for revision and is not allowed to defend a scientific report. In some cases, the rector may consider the issue of the further stay of the graduate student in a higher educational institution.

13. Fund of assessment tools for intermediate certification of students in scientific research

№	Supervised competency code (or part of it)	Controlled sections of the discipline	Name of the appraisal tool
1	GC-1	1. Introduction. Safety briefings. Conversation with the head: drawing up a research plan.	Interview. Monitoring results

2	GC-2	1. Statement of the goal and objectives of the study. Review and analysis of information on the research topic. Conducting theoretical and experimental research.	Interview. Monitoring results
3	GC-3, GC-4, GC-5, GC-6	1. Statement of the goal and objectives of the study. Review and analysis of information on the research topic. Conducting theoretical and experimental research. 2. Processing of experimental data, analysis of results. Preparation of a report and scientific publication.	Report. Scientific publication.
4	GPC-1	1. Statement of the goal and objectives of the study. Review and analysis of information on the research topic. Conducting theoretical and experimental research.	Interview. Monitoring results
4	GPC -2, GPC -3, GPC -4 , GPC -5, GPC -6 , GPC -7	1. 1. Statement of the goal and objectives of the study. Review and analysis of information on the research topic. Conducting theoretical and experimental research. 2. 2. Processing of experimental data, analysis of results. Preparation of a report and scientific publication.	Report. Scientific publication.
5	PC-1	1. 1. Introduction 2. 2. Performing experiments corresponding to the chosen profile of graduate school 3. 3. Processing and presentation of the results obtained	Interview. Protocols of laboratory studies.
6	PC-2	1. Statement of the goal and objectives of the study. Review and analysis of information on the research topic. Conducting theoretical and experimental research. 2. Data processing, publication preparation. experimental analysis of the results. report and scientific work	Report. Scientific publication.

The program has been drawn up in accordance with the requirements of the Federal State Educational Standard of Higher Education in the direction of training 06/08/01 Engineering and technology of construction, qualification "RESEARCHER. TEACHER - RESEARCHER ".

Point-rating system

Point-rating system: 100 points

Drawing up a plan of practice, preparation of methodological support for classes: 20 points

Current job: 25 points

Presentation on the topic of the lesson: 25 points

Exam (written part) - 15 points

Exam (oral part) - 15 points

Grades: 96 - 100 - excellent A

86-94 - excellent B

69 - 85 - good C

61 - 68 - satisfactory D

51 - 60 - satisfactory E
31-50 - unsatisfactory FX
0-30 - unsatisfactory F

To assess the educational activities of graduate students, a point-rating system and ECTS assessments are used.

The point-rating assessment of a graduate student is based on his knowledge, acquired skills and abilities. The maximum number of points that a graduate student can earn during a semester is 100, which corresponds to 100% mastering of the educational material.

Description of ECTS grades:

A - "Excellent": the theoretical content of the course has been mastered completely, without gaps, the necessary practical skills for working with the mastered material have been formed, all tasks provided for by the training program have been completed, the quality of their implementation was assessed by the number of points close to the maximum.

B - "Very good": the theoretical content of the course is mastered in full, without gaps. The necessary practical skills for working with the material mastered have basically been formed, all the educational tasks provided for by the training program have been completed, the quality of the performance of most of them is assessed by the number of points close to the maximum.

C - "Good": the theoretical content of the course has been mastered completely, without gaps, some practical skills of working with the mastered material are not sufficiently formed, all the educational tasks provided for by the training program have been completed, the quality of performance of none of them was not assessed with a minimum number of points, some tasks were completed with errors.

D - "Satisfactory": the theoretical content of the course has been partially mastered, but the gaps are not significant, the necessary practical skills to work with the acquired material are basically formed, most of the educational tasks provided for in the training program have been completed, some of the completed tasks may contain errors.

E - "Mediocre": the theoretical content of the course is partially mastered, some practical skills have not been formed, many of the educational tasks provided for by the training program have not been completed, or the quality of some of them is assessed by the number of points close to the minimum.

FX - "Conditionally unsatisfactory": the theoretical content of the course is partially mastered, the necessary practical skills have not been formed, most of the educational tasks provided for by the training program have not been completed, or the quality of their implementation was assessed by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of the performance of educational tasks.

F - "Absolutely unsatisfactory": the theoretical content of the course has not been mastered. The necessary practical work skills are not formed, all completed study tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the study tasks.

Positive grades, upon receipt of which the course is credited to the graduate student as passed, are grades A, B, C, D and E.

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