Federal State Autonomous Educational Institution of Higher Education "Moscow Institute of Physics and Technology (National Research University)"

APPROVED
Head of Landau Phystech-School of Physics & Research
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Programme for the final state attestation (defence of the graduation thesis)
Performance of and Defence of Graduation Thesis/Выполнение и защита выпускной квалификационной работы

by direction (speciality):	Applied Mathematics and Physics
orientation (profile):	General and Applied Physics/Общая и прикладная физика Landau Phystech-School of Physics & Research
course:	2
qualification:	Master
semester:	4 (Spring)

Программу составили:

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The programme was discussed at a meeting Landau Phystech-School of Physics & Research 04.06.2021

1. Goals and objectives

Goals

The purpose of the implementation and defense of the final qualifying work is to establish the level of preparation of the student to perform professional tasks and the compliance of the results of mastering the educational program with the requirements of the educational standard in the areas of training.

Objectives

- Assessment of the student's ability, relying on the acquired knowledge, skills, and formed competencies, to independently solve problems from the field of their professional activities at a modern level, to professionally present special information, correctly argue and defend their point of view;
- making a decision on awarding the graduate with the qualification "Master" based on the results of the SIA and issuing the graduate a document (diploma) on higher education;
- development of recommendations for improving the training of graduates in this area of training based on the results of the work of the state examination commission.

2. List of competences, the level of which is assessed in the defence of the graduation thesis

As a result of mastering the educational programme a graduate should develop universal / general cultural, general professional and professional competences. The competences are assessed in the course of interim certification of disciplines (modules), practices. During the defence of the graduation thesis graduates should demonstrate the following competences:

Code and name of competence	Indicators of competence achievement
UC-1 Use a systematic approach to critically analyze a problem,and develop an action plan	UC-1.1 Systematically analyze the problem situation, identify its components and the relations between them
	UC-1.2 Search for solutions by using available sources
	UC-1.3 Develop a step-by-step strategy for achieving a goal, foresee the result of each step, evaluate the overall impact on the planned activity and its participants
UC-2 Able to manage the project through all stages of implementation	UC-2.1 Set an objective within a defined scientific problem; formulate the agenda, relevance, significance (scientific, practical, methodological, or other depending on the project type), forecast the expected results and possible areas of their application
	UC-2.2 Forecast the project outcomes, plan necessary steps to achieve the outcomes, chart the project schedule and monitoring plan
	UC-2.3 Organize and coordinate the work of project stakeholders, provide the team with necessary resources
	UC-2.4 Publicly present the project results (or results of its stages) via reports, articles, presentations at scientific conferences, seminars, and similar events
UC-4 Use modern communication tools in the academic and professional fields, including those in a foreign language	UC-4.1 Exchange business information in oral and written forms in Russian and at least one foreign language
	UC-4.2 Use the acquired skills to write, translate, and edit various academic texts (abstracts, essays, reviews, articles, etc.)
	UC-4.3 Present the results of academic and professional activities at various academic events, including international conferences
	UC-4.4 Use modern ICT tools for academic and professional collaboration

Gen.Pro.C-4 Successfully perform a task, analyze the results, and present conclusions, apply knowledge and skills in the field of physical and mathematical sciences and ICTs	Gen.Pro.C-4.1 Apply ICT knowledge and skills to find and study scientific literature and use software products
	Gen.Pro.C-4.2 Apply knowledge in the field of physical and mathematical sciences to solve problems, make conclusions, and evaluate the obtained results
	Gen.Pro.C-4.3 Justify the chosen method of scientific research
Pro.C-1 Assign, formalize, and solve tasks, develop and research mathematical models of the studied phenomena and processes, systematically analyze scientific problems and obtain new scientific results	Pro.C-1.1 Locate, analyze, and summarize information on current research findings within the subject area
	Pro.C-1.2 Make hypotheses, build mathematical models of the studied phenomena and processes, evaluate the quality of the developed model
	Pro.C-1.3 Apply theoretical and/or experimental research methods to a specific scientific task and interpret the obtained results

3. Topics for final qualification theses

Effect of two-cation substitution on the low-energy electrodynamics of M-type hexaferrites

Driven dissipative phases of matter

Development of Noisy Intermediate Scale Quantum Computer based on array of single trapped cold Rb atoms

4. Requirements for the text of a graduation thesis

The text of the final qualifying work is drawn up in accordance with the requirements of the Regulations on the final qualifying work of MIPT students.

5. The procedure for defending a graduation thesis

The main questions on the defense of DFT are regulated by the Regulations on the final qualifying work of MIPT students.

The defense of the final qualifying work is carried out in the form of a report on the results of a scientific research (presentation). The duration of the student's report is no more than 15 minutes. At the end of the report, the student answers the questions of the SEC members without additional preparation time. The student's survey cannot last more than 1 astronomical hour.

Sample questions from members of the State Electoral Commission for the defense of the WRC:

1. What sources did you use when searching for scientific information on the topic of your research?
2. In which publications are the results of your work published?
3. What mathematical models did you use when processing research results?
4. What is the novelty of the results of your research? How would you characterize this novelty: a concept, an idea that enriches a well-known concept, or as a new technique that expands the boundaries of knowledge?
5. At what conferences were the results of your work presented?
6. Why did you choose this particular method for research?
7. What is the error of your chosen analysis method? Show the confidence interval on a graph.
8. Describe your chosen research method.
9. How was the processing of the experimental data carried out?
10. What is the reliability of your results?

11. Formulate the practical value of your research.

12. What is your contribution to the results of scientific works published by the team with your participation?

13. What justifies the theoretical significance of the results of your research?

14. What justified the practical significance of the results of your research?

15. Your forecast for the prospects of using the results of your work.

16. What new scientific facts (factors, hypotheses, tendencies, positions, ideas, proofs) are presented in your work?

17. In the FQP, did you manage to reveal significant contradictions in the known concepts of the subject you are studying (the phenomenon under study, the process under study), if you did, then what are they?

18. What is the result of comparing your author's scientific achievements with the data presented in independent sources on this topic?

19. What software did you use when performing the work and processing the results?

20. How did you substantiate in your work the representativeness of sample sets of units of observation (measurement)?

21. Can you state that there is a consistent research plan on the topic of WRCs? What did you fail in implementing it?

6. Description of the facilities required for the defence of a graduation thesis

Auditorium for the defense of the final qualifying work, equipped with workplaces for students and the state examination commission, a blackboard, multimedia equipment.

7. List of recommended reading

Main literature

1. Regulations on the graduate qualification work of MIPT students (institute-wide, including for LPR, except for appendices 1 and 2, which were replaced by the decision of the Academic Council of the Physical Engineering School, see the link below) https://mipt.ru/docs/download.php?code=prikaz_ob_utverzhdenii_polozheniya_o_vypusknoy_kvalikafitsionnoy_rabote_studentov_mfti_49_1_ot_21_01

2. Rules for LFI students (replaces Appendices 1 and 2 of the institution-wide Regulations on the final qualification work) https://mipt.ru/education/departments/lpr/students/%D0%9F%D1%80%D0%B0%D0%B2%D0%B8%D0%BB%D0%B0%20%D0%9B%D0%A4%D0%98%20%D0%BF%D0%BE%20%D0%92%D0%9A%D0%A0.pdf

3. The order of placement of graduate qualification works in the MIPT electronic library system (institute-wide) https://mipt.ru/education/departments/lpr/students/%D0%9F%D0%BE%D1%80%D1%8F%D0%B4%D0%BE%D0%BA%20%D1%80%D0%B0%D0%B7%D0%BC%D0%B5%D1%89%D0%B5%D0%BD%D0%B8%D1%8F%20%D0%92%D0%9A%D0%A0%20%D0%B2%20%D0%AD%D0%91%D0%A1.pdf

4. The order of the state final certification with the use of distance learning technologies https://mipt.ru/education/departments/lpr/students/%D0%93%D0%98%D0%90%20%D1%81%20%D0%B8%D1%81%D0%BF%D0%BE%D0%BB%D1%8C%D0%B7%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D0%B5%D0%BC%20%D0%94%D0%9E%D0%A2.pdf

5. The literature recommended by the scientific leader on the theme of research.

Additional literature

Foundation of the basic department:

1. Additional literature recommended by the scientific leader on the theme of research.

8. Guidelines for students on completion of the thesis and preparation for the defence

When conducting an DFT and preparing for its defense, one should be guided by the Procedure for conducting state final certification for educational programs of higher education at MIPT.

In the course of writing an DFT, the student is obliged to show the ability to systematize, generalize, consolidate and expand theoretical knowledge and practical skills; deeply and independently investigate a specific problem; apply the knowledge gained in solving specific problems of professional activity; develop practical recommendations in the field of study; present the results of their activities.

The DFT should demonstrate the level of readiness for independent professional activity and is a presentation of the results of the research work performed by him related to solving the problems of the type of professional activity to which the educational program being mastered is focused. The FQP submitted for defense must be presented in compliance with the principles of consistency, argumentation, consistency and be based on the study of theoretical and factual materials, the ability to argue their own proposals, and correctly use special terms.

9. Methodology and assessment criteria for the defence of the graduation thesis

The results of the DFT defense are determined by the grades “excellent”, “good”, “satisfactory”, “unsatisfactory”. The marks “excellent”, “good”, “satisfactory” mean the successful defense of the WRC with the assignment of the corresponding qualifications.

The mark "excellent" (8-10 points) is given if the individual task is completed in full, the student has shown a high level of independence and a creative approach to its implementation.

The mark "good" (5-7 points) is given if the individual task is completed in full, there are some shortcomings in the design of the presented material.

The mark "satisfactory" (3-4 points) is given if the task as a whole is completed, but there are shortcomings in the implementation of individual sections (parts) of the task during practice, there are comments on the design of the collected material.

The mark "unsatisfactory" (1-2 points) is given if the task is completed only partially, there are numerous comments on the design of the collected material.

The grade for the DFT is given by the GEC taking into account the opinion of the scientific advisor, the graduate's report and public discussion, as well as taking into account the following criteria:

- the validity of the relevance of the research topic, the compliance of the content with the topic, the completeness of its disclosure;
- the clarity of the structure of the work and the consistency of the presentation of the material, the methodological validity of the research;
- the effectiveness of using the selected research methods to solve the problem;
- possession of the scientific style of presentation;
- the validity and value of the research results and conclusions obtained, the possibility of their application in practice;
- compliance of the FQP submission form with all the requirements for registration of works;
- the quality of the oral presentation, fluency in the material of the WRC;
- the depth and accuracy of answers to questions, comments and recommendations during the defense of the work.

When evaluating DFTs, publications, copyright certificates, etc. can be taken into account.

The criteria for assessing the defense of DFT are given in the Regulations on the final qualifying work of MIPT students.

10. Peculiarities of final state examinations for persons with disabilities and persons with special needs

For students with disabilities, the final state attestation takes into account the particularities of their psycho-physical development, their individual capacities and health status (hereinafter referred to as "individual characteristics").

The following general requirements shall be ensured in the conduct of the FSA:

– Conducting state final examinations for persons with disabilities in the same room as students without disabilities, if this does not create difficulties for the students when taking the FSA;

– presence of assistant(s) in the classroom to provide students with disabilities with the necessary technical assistance, taking into account their individual characteristics (to take the workplace, move around, read and complete an assignment, communicate with members of the SEC);

– The use of technical aids for students with disabilities in taking the FSA, taking into account their individual characteristics;

– Ensure that students with disabilities have unhindered access to and stay in classrooms, toilets and other facilities.

At the written request of a student with a disability, the length of the student's speech at the defence of the final qualification thesis shall not exceed 15 minutes.

A student with a disability shall submit a written application no later than 3 months prior to the commencement of the State Attestation Examination regarding the need to arrange special conditions for him/her when conducting state attestation tests, indicating the specifics of his/her psychophysical development, individual capabilities and state of health. The application shall be accompanied by documents confirming the learner's individual characteristics (in the absence of these documents in the Directorate of the Institute).

In the application, the student indicates the need (or lack of need) for an assistant to be present at the state certification examination, the need (or lack of need) to increase the length of the presentation during the defence of the graduation thesis in relation to the prescribed duration.