

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

**APPROVED**  
**Head of the Phystech School of  
Applied Mathematics and  
Informatics**  
**A.M. Raygorodskiy**

**Practice program**

<b>course:</b>	Research Practice/Научно-исследовательская практика
<b>major:</b>	Information Science and Computer Engineering
<b>specialization:</b>	Computer Science/Информатика Физтех-школа Прикладной Математики и Информатики Chair of Discrete Mathematics
<b>term:</b>	3
<b>qualification:</b>	Bachelor
<b>type of practice:</b>	training
<b>practice method:</b>	mipt-based

Semesters, forms of interim assessment:

5 (fall) - Grading test  
6 (spring) - Grading test

Author of the program: K.Y. Voytikov, candidate of technical sciences, associate professor, assistant

The program was discussed at the Chair of Discrete Mathematics 04.06.2020

## Annotation

Practice is part of the educational process, designed to ensure a close connection between scientific-theoretical and practical training, to give students the initial experience of practical activities in accordance with the profile of the program.

### 1. General characteristics of practice

#### Purpose of the course

The purpose of the practice is to obtain primary professional skills and professional experience in the field of mathematical modeling of physical, computer and economic systems, computational mathematics, computer technology and data mining. The practice is carried out for the purpose of practical training of students and is aimed at the formation, consolidation, development of practical skills and competencies in the profile of the educational program. During the internship, students prepare for a scientific research type of professional activity.

#### Purpose of practice

- Study of scientific information on the research topic;
- study of research methods;
- mastering the methods of statistical processing of scientific data;
- preparation of a report on the results of practice.

**Forms of practice:** dispersed

### 2. List of the planned results of the practice

Mastering the discipline is aimed at the formation of the following competencies:

Code and the name of the competence	Competency indicators
UC-2 Determine the range of tasks for the set goal and select the best way(s) to solve them, based on current legal regulations, available resources, and constraints	UC-2.1 Determine a set of interrelated tasks required to achieve the current objective, define the expected results of these tasks
	UC-2.2 Work out a solution to a specific task within a project, selecting the best way(s) to solve it, based on current legal regulations, available resources, and constraints
Pro.C-2 Conduct scientific research and testing independently or as a member (leader) of a small research team	Pro.C-2.3 Present research results through scientific publications and participation in conferences
	Pro.C-2.2 Conduct scientific research independently or as a member (leader) of a small research team
	Pro.C-2.1 Apply the principles of scientific work, methods of collecting and analyzing the obtained data and ways of argumentation

### 3. List of the planned results of the practice

As a result of studying the course the student should:  
know:

- Have an idea about the content of scientific activity, about modern research in the field corresponding to the profile of the educational program;
- methods of theoretical and experimental research in the field corresponding to the profile of the educational program;
- principles of organizing experiments and tests;
- the principles of formalizing the results of research work.

be able to:

- Conduct a review of the available material to solve the problem;
- use the chosen method or combine different methods in solving the problem;
- apply modern methods of collecting and processing data during internship;
- to build activities based on the fulfillment of technological requirements and standards, to adhere to legal and ethical standards adopted in professional activities;
- to draw up and present the results of the work performed.

master:

- The skills of analyzing scientific and technical information in the field corresponding to the profile of the educational program.

#### 4. Practice content

##### 4.1. Main stages of practice

№	Practice stage content	Labor intensity (hours), including independent work
5 semester		
1	Preparatory stage	80
2	Review and analysis of modern tools and technologies	100
Total AH in 5 semester		180
6 semester		
3	Implementation of the project	80
4	Results presentation	100
Total AH in 6 semester		180
AH in total		360

##### 4.2. Work content

Semester: 5 (Fall)

###### 1. Preparatory stage

Acquaintance with the topic and goals of the practice. Selection of individual projects by students, development of technical specifications.

###### 2. Review and analysis of modern tools and technologies

Study of available technologies, tools, libraries for project implementation. Selection and justification of the technologies used. Formulation of tasks for the implementation of the project. Planning the timing of their implementation.

Semester: 6 (Spring)

###### 3. Implementation of the project

Work directly on the implementation of the project: writing the source code, deploying the application on the cloud platform.

###### 4. Results presentation

Preparation of a report on the work performed in presentation format, presentation of a report at the final lesson.

##### 4.3. Practice supervision

The practice is managed by the student's appointed scientific advisor, whose duties include:

- scientific and educational-methodical guidance of practice;
- development of individual tasks for students, performed during the practice period;
- assisting students in developing a plan for conducting an internship;
- Conducting consultations (research seminar, lectures) on research;
- control over the implementation of the plan;
- checking the reporting documentation on the implementation of the practice.

The results of practical work should be presented in the form of a presentation demonstrating the work of the developed web application and presented for assessment at the last lesson within the crediting week. The project source code is attached to the presentation.

Based on the results of the practice, the head of the practice gives the student an assessment.

## **5. Description of the material and technical facilities that are necessary for the implementation of the educational process of the course (training module)**

For the practice, you need: a workplace in an educational or scientific unit that is a place of practice, a workplace for independent work containing a personal computer with access to the Internet and the MIPT electronic educational environment, classrooms for group and individual consultations, intermediate certification (at the place of internship). Place of practice: scientific laboratories of basic, institute and faculty departments of the Physics and Technology School of Applied Mathematics and Informatics.

## **6. List of the main and additional literature, that is necessary for the course (training module) mastering**

### **Main literature**

1. Новиков, Ю. Н. Подготовка и защита бакалаврской работы, магистерской диссертации, дипломного проекта [Электронный ресурс]: учеб. пособие / Ю. Н. Новиков. - 4-е изд., стереотип. - СПб.: Лань, 2019.

### **Additional literature**

1. Мейлихов, Е. 3. Искусство писать научные статьи [Электронный ресурс]: науч.-практ. руководство / Е. 3. Мейлихов. - Долгопрудный: Интеллект, 2018

## **7. List of curricular resources for independent work on practice**

QuestelOrbit<https://www.orbit.com/>  
<https://inspec-analytics-app.theiet.org/>

## **8. List of web resources that are necessary for the practice mastering**

Software: MS OfficeMSWindows XP.

## **9. Guidelines for students to master the course**

The assignment for practice is determined by the supervisor, taking into account the specifics of the research work of the department or the base enterprise. The basis of the content of the student's independent work in the implementation of the practice program is the development of methods, techniques, technologies for analyzing and systematizing scientific and technical information, developing plans and programs for conducting scientific research and acquiring practical skills for carrying out research activities, taking into account the interests and capabilities of the department or the base enterprise, where it is held. When completing an individual assignment, the student must combine practical work on the subject of the assignment with a theoretical study of the issue using the recommended information resources. When working with literary sources, it is recommended to draw up a short synopsis with the obligatory fixation of the bibliographic data of the source. Research work ends with writing a report in accordance with the form.

**Assessment funds for practice**

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**Author:** K.Y. Voytikov, candidate of technical sciences, associate professor, assistant

## 1. Competencies formed during the process of studying the practice

Code and the name of the competence	Competency indicators
UC-2 Determine the range of tasks for the set goal and select the best way(s) to solve them, based on current legal regulations, available resources, and constraints	UC-2.1 Determine a set of interrelated tasks required to achieve the current objective, define the expected results of these tasks
	UC-2.2 Work out a solution to a specific task within a project, selecting the best way(s) to solve it, based on current legal regulations, available resources, and constraints
Pro.C-2 Conduct scientific research and testing independently or as a member (leader) of a small research team	Pro.C-2.3 Present research results through scientific publications and participation in conferences
	Pro.C-2.2 Conduct scientific research independently or as a member (leader) of a small research team
	Pro.C-2.1 Apply the principles of scientific work, methods of collecting and analyzing the obtained data and ways of argumentation

## 2. Competency assessment indicators

As a result of studying the course the student should:

### know:

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- methods of theoretical and experimental research in the field corresponding to the profile of the educational program;
- principles of organizing experiments and tests;
- the principles of formalizing the results of research work.

### be able to:

- Conduct a review of the available material to solve the problem;
- use the chosen method or combine different methods in solving the problem;
- apply modern methods of collecting and processing data during internship;
- to build activities based on the fulfillment of technological requirements and standards, to adhere to legal and ethical standards adopted in professional activities;
- to draw up and present the results of the work performed.

### master:

- The skills of analyzing scientific and technical information in the field corresponding to the profile of the educational program.

## 3. Student practice reporting

Interim certification in practice is carried out in the form of a differentiated offset.

During the period of practice, the student is obliged:

- completely fulfill the plan;
- follow the instructions of the head;
- be responsible for the work performed and its results.

The mark for research practice is given to the student by the scientific supervisor according to the results of the defense of his work. The defense of the results of the practice is carried out in the form of a scientific seminar of the department. When assessing practice, the following is taken into account:

- manager's review;
- implementation of a plan;
- presentation of the results of practice;
- practice report of the established form.

### Форма отчета о прохождении практики

<b>ОТЧЕТ</b> <b>о прохождении производственной практики– научно-исследовательской работы</b> <b>_____ семестр, ____ / ____ учебный год</b>	
<b>ФИО обучающегося</b>	
<b>Физтех-школа, группа</b>	
<b>Место прохождения практики</b>	
<b>Задание на практику</b>	
<b>Отчет (проделанная работа и полученные результаты)</b>	
<b>Отзыв руководителя о работе обучающегося</b>	
<b>Оценка руководителя за работу обучающегося</b>	

Обучающийся \_\_\_\_\_ дата \_\_\_\_\_ составления \_\_\_\_\_ отчета \_\_\_\_\_

Контактный телефон: 8-9\_\_-\_\_-\_\_-\_\_

Научный руководитель \_\_\_\_\_ / \_\_\_\_\_ /

Контактный телефон: 8-9\_\_-\_\_-\_\_-\_\_ e-mail: \_\_\_\_\_

Зав. кафедрой \_\_\_\_\_ / \_\_\_\_\_ /