Ministry of Science and Higher Education of the Russian Federation
Federal State Autonomous Educational Institution of Higher Education
**Perm National Research Polytechnic University**

Faculty of Electrical Engineering
Department of Information Technologies and Automated Systems

# INTERNSHIP PROGRAM

| | |
|---|---|
| **Form of internship:** | Practical Training |
| **Type of internship:** | Introductory |
| **Format:** | Discretely by type of internship |
| **Workload in hours (in credits):** | 3 (CU) |
| **Duration of internship:** | 108 hours, 2 weeks |
| **Level of higher education:** | Bachelor |
| **Form of education:** | Full-time studies |
| **Training program (degree):** | 15.03.06 Mechatronics and Robotics technology |
| **Direction:** | Robotics technology in computer-aided manufacturing |

Perm 2021

# 1 General Provisions

In accordance with paragraph 24 of Article 2 of the Federal Law of December 29, 2012, M 273-FZ "Education in the Russian Federation" internship refers to the practical training of students as a form of educational activity organization during the development of an educational program in the conditions of performance by students of certain types of work-related to future professional activity and aimed at the formation, mastering, development of practical skills and competencies on the profile of the appropriate educational program.

In accordance with the "Provisions on practical training of students" approved by the Ministry of Science and Higher Education of the Russian Federation and the Ministry of Enlightenment of the Russian Federation from 5th August 2020 № 885/390, the educational activities in the form of practical training can be organized not only during practical training but also in the implementation of academic disciplines (modules) and other components of educational programs as provided by the training program.

Practical training during internship is organized by a direct performance by students of certain types of work associated with future professional activity.

## 1.1 Goals and Objectives of the Course

**The goal of the internship** is to form a system of knowledge and skills providing preparation for a bachelor to project activities in the field of information and communication technologies.

**Objectives of the internship are:**

- performance of the stages of work defined by the individual task, timetable, the form of presentation of reporting materials and providing the fulfillment of planned in the competence format results;
- completion of the reports, containing the materials of the work stages, revealing the level of mastering of the specified list of competencies;
- preparation and defense of the results.

## 1.2 The place of internship in the structure of the educational program

## 1.2.1 Block (module): B2 «Internship»

## 1.2.2 Course: 1-2 (1-4 semester)

## 1.2.3 Relationship to curriculum disciplines

| List of previous disciplines | List of subsequent disciplines |
|---|---|
| Scientific-research work | |

## 2 Planned Results of the Course Training

| Competences | Indicator of Attaining Competence which the planned results of training are correlated with | List of Planned Results of Training during the Internship |
|---|---|---|
| **RPC-1** Is able to participate in research and development work. | **IA-2$_{RPC-1}$ Is able to** summarize, analyze and systematize information for the preparation of analytical reviews on a given | **Has mastered the skills** of searching for scientific and technical information; setting scientific and technical |

| | topic.<br>**IA-3₍RPC-1₎ Has mastered the skills** of independent study, critical understanding and systematization of scientific and technical information. | problems in the field of information systems and software based on knowledge of the problems of this industry and experience in solving them; development of a research plan within the framework of the tasks; analysis of research using tools of applied software and information and communication technologies; registration of the results of the studies carried out in accordance with the requirements of regulatory documents. |
|---|---|---|

## 3 Course contents

### 3.1 The content of the internship work types

The general structure of work experience internship consists of 3 stages. Work experience internship (R&D) is oriented towards independent work. The content of internship by type of work and reporting forms during training is presented in Table 2.1.

Table 2.1 The content of internship by type of work and reporting forms

| Internship stages | Forms of internship work (other internship work, except for contact with teachers) | Workload in hours or days | Means of Assessment |
|---|---|---|---|
| Initial | Introductory lesson: preparation for the internship, setting the internship's purpose and objectives; with the internship's stages; with the requirements for students; with the used normative and technical documentation, methods of research and analysis, literature for the report preparation. | 1 day | Interview |
| Basic | Collection, analysis and systematization of information. Includes | 3 days | Interview, mark in the internship work plan |

| | the following types of work: analysis of regulatory documents; studying the technology of scientific research; applying the knowledge gained to an individual research topic; collection of information on the selected topic. | | |
|---|---|---|---|
| Basic | Studying and description of the equipment used to organize the computing systems work, computer technology, department technical means. | 3 days | Interview, mark in the internship work plan |
| Basic | Studying and description of operating systems and software products used at the department, information flows description. | 3 days | Interview, mark in the internship work plan |
| Final | Drawing up an internship report | 4 days | Report |
| Total | | 14 days | Grading test |

## 3.2 Forms of student's contact work with teaching staff

The structure of internship and labour intensity is shown in the Table 3.2

Table 3.2 The structure of internship and labour intensity

| Sections (stages) of internship | Number of academic hours | | | | | Workload in hours / CU |
|---|---|---|---|---|---|---|
| | Total | Contact work | | | The other kinds of work | |
| | | Lectures | PT | CIW or internship guiding[1] | | |
| Initial | 9 | - | - | 1 | 8 | |
| Basic | 81 | - | - | - | 81 | |
| Final | 18 | - | - | 1 | 17 | |
| Total | 108 | - | - | 2 | **106** | **108 /3 CU** |

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[1] At a rate of 1 hour a week per one student

## 3.3 Content of organizational arrangements for the internship. Methodological guidelines for students in the internship.

The process of organizing the research work consists of three stages:
* preparatory;
* basic;
* final.

**The preparatory stage** usually consists of the following activities:

1. Conducting general meetings of students sent to internships.

The meeting is held to familiarize students with:
* purposes and objectives of R&D;
* stages of R&D;
* requirements that apply to internship places and students;
* used normative and technical documentation.

2. As a rule, the internship training place is the department where the student is studying, however, the student can offer his own idea about the internship place, agreed with the department.

If the student has a contract for targeted training, signed by three parties: a student, PNRPU, an enterprise, ready to provide places for internship and to employ after graduating from PNRPU, the student is sent to this enterprise. It should be borne in mind that in accordance with the Federal Law of December 29, 2012 No. 273-FL "About Education in the Russian Federation" the organization of the internship provided for by the educational program is carried out by the university on the basis of contracts with organizations operating under the educational program of the relevant profile.

3. Before the start of internship, students receive and prepare forms of individual assignments for practice in the form of a calendar plan, a title page of the practice report (see attachments). Students are instructed at the department (enterprise) on the procedure for practical training, on safety and on safety on the way to the place of practice.

**The basic stage**

Operational supervision of students' research work is conducted by scientific advisers from the department. At this stage students perform their duties, determined by the internship program and the department's requirements.

The main internship form is the independent fulfillment of the assigned tasks by the students. The main purpose of this stage is to introduce the student to academic work.

It is envisaged to conduct separate practical classes, independent study by students of the normative and technical literature provided to them. The main methods of studying production are personal observation, expert assessments based on interviews with specialists, familiarization with normative and technical documentation, performing an individual task, etc. The student has the right in the prescribed manner to use the literature, technical documentation and other materials on the internship program available at the department.

**The final stage** completes the internship and is carried out no later than the beginning of the new semester on the educational process's schedule.

At the end of the internship, before the test, students submit to the department the following documents:
* written practice report;
* an individual assignment for practice in the form of a work schedule (plan) for the practice and notes on its implementation.

The reports are reviewed by scientific advisers and are subject to prior evaluation and defence after verification of their conformity with the requirements.

### 3.3.1 Scientific advisers

To guide the internship carried out at PNRPU, an adviser (s) for practical training is appointed from among the persons belonging to the faculty of PNRPU.

Scientific adviser from the department:

- guarantees the organization of educational activity in the form of field work training and (or) realization of other components of educational program;
- organizes the participation of students in certain types of work related to future professional activities;
- provides methodological assistance to students in certain types of work related to future professional activities;
- bears responsibility, together with a field work supervisor for the implementation of the educational program's components in the form of practical training and bears responsibility for the life and health safety of students and employees of PNRPU therefore must inform them about safety rules, labor protection rules, safety measures and sanitary, epidemiological rules, hygiene standards.

### 3.3.2 Students' Responsibilities

While doing R&D, the student is obliged to:

- carry out the tasks provided for in the individual plan in line with expectations;
- comply with the internal work regulations and regime in force at the enterprise (institution, organization);
- strictly observe occupational safety, health rules, labor protection requirements and industrial safety requirements;
- to be responsible for the work performed and the results thereof equal to regular employees;
- to submit R&D reports to the scientific adviser on time and to take R&D credits.

### 3.4 Topics of individual assignments for internship

1. Analysis of computer technology, technical means of automation of an enterprise / department.
2. Analysis of operating systems and software used in the enterprise / department.
3. Study the list of sensors and actuators of mechatronic and robotic systems.
4. Collecting information about the functions and patterns of operation of the robotic system's elements.
5. Study the scheme of mechatronic and robotic systems's algorithm and control program.

### 4 The Assessment Tool Fund for the Interim Students Assessment in Internship

The midterm certification in practice is carried out in the form of defense of a written report on practice.

The indicators of competency development in practice contain a characteristic of work types performed by the student during the internship, the criteria are an indication of their performance volume and quality in accordance with the technology and (or) the organization's requirements in which the internship took place. Criteria for competency assessment and the assessment scale for interim assessment for internship are presented in Table 4.1.

Table 4.1 Assessment criteria for the levels of competency development during the internship in 1st

semester

| Competence achievement indicators | Types of work | Assessment tools | Evaluation tools and scores | | | |
|---|---|---|---|---|---|---|
| | | | excellent | good | satisfactory | unsatisfactory |
| Is able to generalize, analyze and organize information for the preparation of analytical reviews on a given topic. | Search for scientific and technical information; setting scientific and technical problems in the field of information systems and software based on knowledge of the problems of this industry and experience in solving them. | Internship report | The search for scientific and technical information was carried out independently. The setting of scientific and technical problems in the field of information systems and software is based on knowledge of the problems of this industry and experience in solving them. | The search for scientific and technical information was carried out with the partial assistance of the head. The setting of scientific and technical problems in the field of information systems and software is based on knowledge of the problems of this industry and experience in solving them with certain inaccuracies. | The search for scientific and technical information was carried out with the help of the supervisor. The setting of scientific and technical problems in the field of information systems and software is based on knowledge of the problems of this industry and experience in solving them with significant inaccuracies. | The conditions to get the grade "satisfactory" are not met |
| Masters the skills of independent study, critical comprehension and systematization of scientific and technical information. | Development of a research plan within the framework of the assigned tasks; analysis of the research results obtained using the means of applied software and information and communication technologies; registration of the results of the studies carried out in | Internship report | The research plan was independently developed within the framework of the assigned tasks. The analysis of the research results obtained using the means of applied software and information and communication technologies was carried out deeply and reasonably. The practice report contains all the necessary results of the research | The research plan within the framework of the assigned tasks was developed with the partial help of the head. The analysis of the research results obtained using the means of applied software and information and communication technologies was carried out insufficiently deeply and reasonably. The practice report contains the main results of the research carried out and | The research plan within the framework of the assigned tasks was developed with the help of the supervisor. The analysis of the research results obtained using the means of applied software and information and communication technologies was carried out not deeply and without justification. The practice report contains the main results of the research carried out and is prepared | The conditions to get the grade "satisfactory" are not met |

| | | carried out and is drawn up in accordance with the requirements of the regulatory documents. | is prepared mainly in accordance with the requirements of regulatory documents. | mainly in accordance with the requirements of regulatory documents. | |
|---|---|---|---|---|---|
| | accordance with the requirements of regulatory documents. | | | | |

The midterm certification in internship is carried out in the form of a written report defense on practice. The results are assessed on a 5-point system separately for the performance of each labor action and / or type of work, documented.

To determine the overall score in practice, the average score of the scores obtained is calculated.

The evaluation of R&D results is carried out on a 5-point scale, taking into account the following provisions:

- if master's research paper is scored 3.0 points and below, it is marked "unsatisfactory";
- if master's research paper is scored from 3.0 to 3.99 points, it is marked "satisfactory";
- if master's research paper is scored from 4.0 to 4.99 points, it is marked "good";
- if master's research paper is scored from 4.5 points, it is marked "excellent".

# 5 List of educational literature and Internet resources needed for the internship

## 5.1 Paper-based courseware

| № | Bibliographic entry (author, title, mode of publication, place, publishing house, year of publication, number of pages) | Number of copies in the library |
|---|---|---|
| **1 Basic literature** | | |
| 1 | Kafrissen E., Stephans M. Industrial robots and robotics. Reston, Virginia : Reston Publ., 1984 URL: elib.pstu.ru/Record/RUPSTUbooks229781 | 1 |
| 2 | Dorf R.C. Modern Control Systems. Reading, Massach : Addison-Wesley Publ. Co, 1990 URL: elib.pstu.ru/Record/RUPSTUbooks17593 | 1 |
| 3 | Zhmud, V. A., Dimitrov, L. V., Nosek, J. Numerical Optimization of Regulators for Automatic Control System. textbook for higher education 2019 URL:elib.pstu.ru/Record/ipr98687 | 1 |
| 4 | Buchanan R. C. Ceramic Materials for Electronics : Processing, Properties, and Applications. New York : Marcel Dekker, 1986 URL: elib.pstu.ru/Record/RUPSTUbooks230909 | 1 |
| **2 Additional literature** | | |
| 1 | Osgood C. Fatigue Design. Oxford [et al.] : Pergamon Press, 1982 URL: elib.pstu.ru/Record/RUPSTUbooks249641 | 1 |

| 2 | McGrow-Hill Personal Computer Programming Encyclopedia. Languages and Operating Systems. New York : McGraw-Hill Publ. Co, 1989 URL: elib.pstu.ru/Record/RUPSTUbooks14853 | 1 |
|---|---|---|
| 3 | Architectural Support for Programming Languages and Operating Systems: Fourth International Conference, Santa Clara, California, April 8-11, 1991 URL: elib.pstu.ru/Record/RUPSTUbooks3602 | 1 |
| 4 | Theory and application of digital control. Oxford : Pergamon Press, 1982 URL: elib.pstu.ru/Record/RUPSTUbooks229558 | 1 |

## 5.2 Electronic Courseware

| Name of training tool | Reference to information resource | Accessibility of EBN (Internet / local net; authorized / free access) |
|---|---|---|
| A TRUSTED HUB FOR ELECTRONICS ENTHUSIASTS | https://www.electronicshub.org/ | Internet |

## 6 List of information technologies used in the internship

### 6.1 List of software

Table 6.1 Licensed software configuration used in the educational process during the internship

| № | Name of the software | Registration N | Application |
|---|---|---|---|
| 1 | Operation system Microsoft Windows | 42615552 | application software for working with electronic tables, processors, database systems, integrated software packages; |
| 2 | Microsoft Office | 42661567 | office package of applications for working with different types of documents: texts, spreadsheets, databases, etc. |

### 6.2 List of databases and reference information systems

Table 6.2 List of databases and reference information systems

| The form of a database | Name |
|---|---|
| Electronic resource | The State Committee for Statistics https://www.ks.ru |
| Electronic resource | Consultant Plus - reference legal system: documents and comments: universal, inform. resource - Prof. network version. - Moscow. 1992. Access mode: Computer, PNRPU chain of scientific library, free access. |

## 7 Material and technical base required for the internship

For full practice of the bachelors in the direction 15.03.06 "Mechatronics and robotics technology", profile "Robotics technology in computer-aided manufacturing" is provided access to multimedia classrooms and computer labs.

Realization of practical training is focused on independent learning activities under the guidance and control of the internship adviser from the Department of Information Technology and Automated Systems, where the student does an internship. The department (at the Faculty of Electrical Engineering) has classrooms equipped with the necessary training equipment. In order to perform individual assignments and write reports, students are provided with access to these classrooms with the necessary software access to the Internet.

Table 7.1 Specialized laboratories and classes

| № | Rooms | | | Area, m$^2$ | Seating capacity |
|---|---|---|---|---|---|
| | Name | Placement (department) | Number of the classroom | | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Classrooms with computers | Department of Information Technology and Automated Systems | 126 (Building A) | 80 | 30 |

The following equipment is used during the practice directly at PNRPU units.

Table 7.2 Teaching equipment

| № | Name and make of equipment | Number of units | Operating equipment | Number of classroom |
|---|---|---|---|---|
| 1 | 15 computers Pentium Core 2 Duo E8400/RAM-2Gb/NDD-160Gb OVD-RW, networked, with permanent Internet access | 15 | operating control | 126 (Building A) |
| 2 | Multimedia Projector and Electric Screen | 1 | operating control | 126 (Building A) |
| 3 | Structured Cable System | 1 | operating control | 126 (Building A) |
| 4 | 3D Printer. | 1 | operating control | 126 (Building A) |
| 5 | Complex training robotic systems | 5 | operating control | 126 (Building A) |

Senior lector of ITAS Department                      V.G.Sheremetyev

APPROVED BY:
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PhD in Engineering                 D S. Repetskiy

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Faculty of Electrical Engineering

Department of Information Technology and Automated Systems

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# REPORT
## on the Introductory Practical Training

Performed     by     the     student
gr._____

_____
(Full name)

_____
(signature)

Verified by:

_____
(post, full name of practical training adviser from the department)

_____     _____
(mark)                          (signature)

_____
(date)

**Perm  2021**

*The form of work schedule (plan) with the individual internship assignment (R&D)*

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Faculty of Electrical Engineering

Department of Information Technology and Automated Systems

Training program (degree): 15.03.06 Mechatronics and Robotics technology

APPROVED BY

Head of the ITAS
department, Doctor of
Economics

_____ R.A. Fayzrakhmanov

«_____ »_____2021

**Work schedule of the internship**

**Form of internship:** Practical Training

**Type of internship:** Introductory

**Place of the Internship:**

**Time and duration of the internship:**

**Academic group:**

AUTHOR:
(post, full name of scientific adviser)

(signature)          (date)

**Perm 2021**

(Full name)

**The research topic:**

**2. Objective: to develop competences in line with the requirements of the internship program:**

Is able to participate in research and development work

**3. Work schedule (plan) of internship.**

| Name of stage | Name of activity | Place of internship (Department) | Deadlines | | Performance mark (evaluation and signature of internship supervisor) |
| --- | --- | --- | --- | --- | --- |
| | | | start | end | |
| 1st stage (preparatory) | | | | | |
| 2nd stage (basic) | | | | | |
| 3rd stage (final) | | | | | |

**4. Training place:**

**5. Deadline for the student to submit a practice report and for practice manager from the host organization to submit a recall to the practice supervisor from the department:**

**6. Report content**

**7. The requirements for the development of the reporting documents**

The results of the work must be submitted in the form of a report on the execution of the works, issued in accordance with the requirements of GOST 7.32-2017. Report on R&D. Structure and formation rules.

The report must be at least 1O pages (not including supplements) of typewritten text (font 12 pt, Times New Roman, 1 interval). The report must be printed on A4 sheets, formatted to the width. A work schedule (plan) of the practice is attached to the body of the report.

Internship supervisor from the department

(signature)        (full name)

The assignment has been accepted

(signature)        (full name)

« » _____2021

## Change Registration List

| № | Content of change | Date, protocol number of the department meeting, signature of the department head. |
|---|---|---|
| 1 | 2 | 3 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
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