Syllabus
Practice Program

Pre-Graduation Practice

Specialty
113 – Applied Mathematics

Institute
Institute of Computer Modeling, Applied Physics and Mathematics

Educational program
Computer and Mathematical Modeling

Department
Mathematical Modeling and Intelligent Computing in Engineering (161)

Level of education
Master's level (1 year 4 months)

Type of the educational component
Special (professional), Mandatory

Semester
3

Language of instruction
English

Developers

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PhD, Associate Professor of the Department " Mathematical modeling and intelligent computing in engineering "

Author of more than 90 scientific and methodological publications.

Leading lecturer in the following disciplines: "Theory of Dynamic Theory of Dynamic Processes-I, Theory of Dynamic Processes-II, Finite Element Method, "Mathematical methods of analysis of machine dynamics, Nonlinear processes and models, "Modelling of dynamic processes.
More information on the department's website

General information

Summary

Pre-graduation practice is a component of the educational process, an important stage of engineering training, and the final stage of the master's thesis. At the beginning, the student must receive an individual assignment from the practice supervisor, which specifies the topic of the practice and the timeframe for mastering it at a given workplace. Throughout the practice, students are required to keep a diary in which they note the work they have done, attendance at lectures, meetings and excursions, studying of literary sources, etc. During the practice period, students must follow company's rules. The goal of practice is to combine work on a specific problem in a team with adaptation in it. This provides an opportunity to make independent decisions, fosters the need to systematically update their knowledge and apply it creatively, and stimulates their mastery of modern methods and research tools in the field of their future profession. Within 1 week after the end of the practice, students pass a differentiated credit to the commission appointed by the Head of the Department. The test is passed in the form of a presentation of a report prepared in accordance with the general requirements for research and

development and signed by the head of the practice. A practice diary signed by the supervisor and stamped by the practice site is also required.

Objectives and goals

Goal: consolidation and direct use of knowledge and skills acquired by students during the previous period of study, development of materials for master's thesis, as well as preparation for independent professional activity.

Objectives: studying the structure of the institution, problems and practical participation in the performance of work, searching for scientific and technical information for the master's thesis, completing sections related to the task statement, model selection, algorithm and program development, studying the planning and determination of the economic efficiency of research work, studying occupational safety and health, acquiring skills in the work team.

As a result of the internship, students should:

know: the general structure of the enterprise and the directions of its research work, the current state of scientific developments in the fields related to the topic of the master's thesis, hypotheses and methods used in solving the problem, the procedure for using software tools to study the problems of applied mechanics, dynamics and strength and processing of scientific and technical information, the basics of organizing, planning and managing scientific research at the enterprise, issues of labour organization and environmental protection;
to be able to: explain the purpose and functioning of the research object, formulate the research problem and justify the choice of solution method, create a program for processing information on a computer, use industrial software systems with professionalism, conduct an experiment methodically correctly and process its results;
acquire skills in searching for and using scientific and technical information, developing algorithms and software tools, and analyzing the results.

Format of activities

The basis of this type of practice is the self-study of the student to perform a specific individual task in the work team. Based on the results of the work, a report on pre-graduation practice, and a practice diary are prepared. The practice is assessed in the form of a presentation of the results.

Competencies

GC2. The ability to adapt and act in a new situation, to show initiative and entrepreneurship.
GC3. Ability to master modern knowledge, formulate and solve problems.
GC4. Ability to act socially, responsibly and consciously.
GC5. Ability to conduct professional activities, in particular in the international environment.
GC7. Ability to think abstractly, analyse and synthesise.
PC1. Ability to solve tasks and problems that can be formalised, require updating and integrating knowledge, in particular in conditions of incomplete information.
PC2. Ability to conduct scientific research aimed to develop new and adapt existing mathematical and computer models to study various processes, phenomena and systems, conduct appropriate experiments and analyse the results.
PC4. Ability to develop and research mathematical and computer models, conduct computational experiments and solve formalised problems using specialised software.
PC9. The ability to mathematically formalise the formulation of scientific and practical problems, to choose a mathematical analytical or numerical method of its solution, which ensures the required accuracy and reliability of the result.
PC12. Ability to identify the essence of scientific and technical problems in professional activities, to apply appropriate mathematical models for the study of mechanical objects and processes.

Learning outcomes

LO2. Collect, systematize and analyse scientific and technical information on professional activities.

LO3. Logically, consistently and accurately formulate their thoughts and present information in professional communication, apply information and technical means and pedagogical methods to present the results of scientific, applied and IT projects
LO11. Possess skills of abstract thinking, analysis and synthesis.
LO12. To be able to work in a team, develop and manage research, applied and IT projects, potentially in an international environment.
LO13. Have knowledge in preparing scientific and technical reports on completed design or research work and in implementing the results of research and development.

Student workload

Pre-graduation practice takes place in the 3rd semester. Its total volume is 450 hours (15 ECTS credits), including 450 hours of self-study. Final control - practice report, presentation.

Duration of the practice

The duration of the practice is 8 weeks.

Prerequisites for the educational component

Knowledge, skills from all disciplines of the curriculum must be successfully mastered during the previous period of study.

Features of the educational component, teaching and learning methods, and technologies

The main feature of pre-graduation practice is the student's self-study to improve their theoretical and practical training in the process of working on a specific problem in order to acquire sustainable professional skills and adaptation in the workforce.
Differentiated credit is passed in the form of a presentation of the practice report to a commission of teachers.
Responsibilities of students
Students must comply with the following rules during the practice:
- before the start of the practice, receive information from practice supervisor from the department on preparation of all necessary documents;
- to start the task on time at the place of practice;
- adhere to labour discipline and labour protection rules;
- during the period of practice, students must follow the work schedule of the company, deviations from which are allowed only with the permission of the of the head of the practice from the company;
- pass the differentiated credit on time.
Responsibilities of the practice supervisor from the department
The responsibilities of the departmental practice supervisor include:
- coordinating the practice programme with the company;
- preparation of a draft order on the placement of interns at the practice base;
- holding an organisational meeting of interns;
- conducting events at the end of the practice: organisation of the differentiated credit;
- reporting to the practice department of NTU "KhPI";
- preparation of materials on the results of the practice for the meeting at the department.

Topics of the individual assignment

Possible places of practice and its schedule.
Practice is carried out at enterprises, institutions and organizations of scientific research, engineering, fuel and energy, etc. profiles, in departments, laboratories, groups of any form of ownership, which carry out research in the field of applied mathematics, dynamics and strength of machines, structural elements, as well as the development and use of software and information technologies in these fields.
Content of practice and individual task.

The basis of this type of practice is the self-study of students on a specific problem. Students usually perform an individual task at one workplace in accordance with the profile of the department, laboratory, the topics of which can be: theoretical calculation of the stress-strain state of a part or structure or analysis of a technological process using the methods of the theory of elasticity, plasticity or creep; research of dynamic, thermal and electromechanical processes in details and structures, in liquids and gases; analysis and synthesis of structures and mechanical systems based on research into issues of immediate and long-term strength, endurance, stability, reliability; optimization of structural elements according to mechanical characteristics; experimental study of the deformation properties of materials and structures through static and dynamic tests; experimental data processing; creation and modernization of software tools and databases necessary for strength calculations and so on.

You should also pay attention to the important stages of the task:

1. Organisation and planning of research work in the unit where the student is doing the practice.
2. Studying the literature and compiling a brief review.
3. Mathematical formulation of the problem and selection of the method of its solution.
4. Development of software tools in the form of standalone programs or modules for existing complexes.
5. Performing calculations using the developed software tools.
6. Development of computational models, preparation of initial data and execution of calculations using application software packages.
7. Coordinated work in groups on joint projects.
8. Purpose, principle of operation and load characteristics of the object under study.
9. Features of modelling the object of study.
10. Preparation of equipment for experiments and testing.
11. Mathematical processing of test results.
12. Development and use of information technology in the problems of applied mathematics.
13. Analysis of the results obtained.
14. Preparation of the report.

The results obtained during the practice are subsequently completed and summarized in the relevant sections of the master's thesis.

Control measures. Requirements for reporting and defending the results of practical training

The documentation prepared by each student for the practice review committee includes a practice report approved by the supervisor, a practice diary, and a presentation of the results.
The practice report is prepared in accordance with the general requirements for the preparation of research and development work and contains the following main sections:

1. Title page;
2. Abstract;
3. Table of contents;
4. Introduction - general characteristics of the object of study, justification of the relevance of the topic of work;
5. Problem statement - formulation of research objectives, basic hypotheses and relationships used in the work, experimental setup, characteristics of the equipment used, etc;
6. Method of solution - presentation of the algorithms used, description of software tools and the procedure for their use, test examples, the procedure for conducting tests and processing their results, etc;
7. Calculation of results and their analysis;
8. Conclusion - brief conclusions on the work;
9. List of used sources of information (except Russian);
10. Appendices (if necessary) - program listings, files, exam reports, etc.

Materials and recommended reading

1. Educational program "Computer and mathematical modelling." - Access mode: https://blogs.kpi.kharkov.ua/v2/quality/op-magistr-2023/
2. Regulations on the organization of the educational process at the National Technical University "Kharkiv Polytechnic Institute." - Access mode: https://blogs.kpi.kharkov.ua/v2/nv/dokumenty/
3. Regulations on the procedure for practical training of higher education students of the National Technical University "Kharkiv Polytechnic Institute." - Access mode: https://blogs.kpi.kharkov.ua/v2/nv/dokumenty/

Assessment and grading

Criteria for assessment of student performance, and the final score structure

The final grade of the student based on the results of practical training is given by a commission of teachers of the department appointed by the head. 100% of the final grade consists of:
- the results of the preparation of the practice report, practice diary and supervisor's feedback (60%);
- presentation of work, evaluation of answers to questions (30%);
- completion in accordance with the deadlines and quality of the report (10%).

Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

Norms of academic ethics and integrity

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility, including when visiting the practice site. Conflict situations should be openly discussed in academic groups with lecturers and supervisors, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management. Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

Approval

Approved by	Date August 30, 2023	Head of the department Oleksii VODKA
	Date August 30, 2023	Guarantor of the educational and professional program (1 year 4 months) Oleksiy LARIN