National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Department of Automation of Electrotechnical and Mechatronic Complexes

Practice

Working program of educational discipline (syllabus)

Реквізити навчальної дисципліни	
Higher education level	*Second (master)*
Knoweledge domain	14 Electrical Engineering
Specialty	141 Electric Power Engineering, Electrotechnics and Electromechanics
Educational program	EPP, ESP "Engineering of intelligent electrical and mechatronic complexes"
Status of the discipline	*Normative*
Form of education	*Full-time (day-time)/remote/mixed*
Year of study**, semester**	*2 course, autumn semester*
Обсяг дисципліни	*44 credits /420 hours*
Semester control / control activities	*Exam*, *modular test*
Schedule	*http://roz.kpi.ua/*
Language of study	*English*
Information about the course leader /teachers	Lections and seminars are given by: *PhD, assoc. prof., , assoc. prof. of Department of AEMC Viktor Gorodetskyi, v.gorodetskyi@ukr.net*
Placement of the course	Available on the Sikorsky platform. The access code is provided by the teacher at the first lesson.

Program of educational discipline

1. Description of the discipline, its purpose, subject of study and learning outcomes

Student practice is a mandatory component for obtaining a master's degree in specialty 141 "Electrical power engineering, electrical engineering and electromechanics" of the educational program "Engineering of intelligent electrotechnical and mechatronic complexes".

The purpose of the practice is to collect the material necessary for the completion of the master's thesis, to solve fundamental design and construction issues from the general and special parts of the thesis, to prepare for independent work in various engineering positions, to deepen and consolidate theoretical knowledge, to gain experience in organizational work in the team of the station, workshop, department of an enterprise or institution, to get acquainted with the practice of entrepreneurship.

The subject of practice is deepening the skills of independent theoretical and practical work, broadening the worldview of students, researching the problems of practical activity at the enterprise, in the office, in the institution and the ability to solve them.

Tasks of practice – studying the rules of operation and construction of equipment of electrotechnical and mechatronic complexes, typical malfunctions and methods of their elimination; issues of economics,

planning and production management; the organization of design and construction work, the procedure for developing, passing and approving project technical and design documentation; acquisition of practical skills in equipment design and modernization; familiarization with issues of innovative activity at enterprises; collection of materials for the dissertation; generalization, consolidation and deepening of knowledge from special disciplines; acquisition of practical skills, knowledge of professional and organizational activities in positions according to the chosen profession.

The place of practice must be related to the topic of the master's thesis. The place of practice is approved by an order of the university. During pre-diploma practice at enterprises, a student with relevant work experience in production can occupy a corresponding engineering position of a lower management level or be their backup. The student practices at the enterprise in those units where he can get the most complete information and materials for his master's thesis.

Program competencies: (K01) Ability to search, process and analyze information from various sources; (K02) Ability to use information and communication technologies; (K03) Ability to apply knowledge in practical situations; (K07) Ability to identify and assess risks; (K10) Ability to communicate with representatives of other professional groups at different levels; (K11) Ability to apply existing and develop new methods, techniques, technologies and procedures for solving engineering tasks of electric power, electrical engineering and electromechanics; (K12) Ability to develop and implement measures to increase reliability, efficiency and safety in the design and operation of equipment and objects of the power industry, electrical engineering and electromechanics; (K13) Ability to carry out analysis of technical and economic indicators and examination of design and construction solutions in the field of electric power, electrical engineering and electromechanics; (K14) Ability to demonstrate knowledge and understanding of mathematical principles and methods required for use in electrical power, electrical engineering, and electromechanics; (K15) Ability to understand and take into account social, ecological, ethical, economic and commercial considerations affecting the implementation of technical solutions in electric power, electrical engineering and electromechanics; (K16) Ability to manage projects and evaluate their results; (K17) The ability to develop plans and projects to ensure the achievement of a specific goal, taking into account all aspects of the problem being solved, including production, operation, maintenance and disposal of equipment of electric power, electrotechnical and electromechanical complexes; (K18) Ability to demonstrate awareness and ability to use normative legal acts, norms, rules and standards in electric power, electrical engineering and electromechanics; (K19) Ability to use software for computer modeling, automated design, automated production and automated development or construction of elements of electric power, electrotechnical and electromechanical systems; (K20) Ability to demonstrate awareness of intellectual property and contract issues in electricity, electrical engineering and electromechanics; (K21) Ability to formulate technical requirements for products and technologies under development, determine technical conditions of operation and maintenance of new equipment, draw up technical tasks for research and development, highlight key technological parameters of developments and determine their target or normative values in the field of engineering; (K22) Ability to develop means, methods and methods of

science and technology aimed at automating existing and creating new automated and automatic technologies and productions; (K23) Ability to optimize technological processes and build structural diagrams of intelligent automated control systems.

Program learning outcomes: (PR01) Reproduce processes in electric power, electrotechnical and electromechanical systems during their computer simulation; (PR02) Outline a plan of measures to increase the reliability, safety of operation and prolong the resource of electric power, electrotechnical and electromechanical equipment and relevant complexes and systems; (PR03) Analyze processes in electric power, electrotechnical and electromechanical equipment and corresponding complexes and systems; (PR05) To have the methods of mathematical and physical modeling of objects and processes in electric power, electrotechnical and electromechanical systems; (PR11) Communicate freely orally and in writing in national and foreign languages about modern scientific and technical problems of electric power, electrical engineering and electromechanics; (PR12) Demonstrate understanding of regulatory acts, norms, rules and standards in the field of electric power, electrical engineering and electromechanics; (PR13) Identify the main factors and technical problems that may interfere with the implementation of modern methods of controlling electric power, electrotechnical and electromechanical systems; (PR14) Master new versions or new software designed for computer modeling of objects and processes in electric power, electrotechnical and electromechanical systems; (PR16) Choose the element base of electromechanical and mechatronic systems, complete electric and hydraulic drives, means of control, protection, automation of power supply systems of machines and installations, production sites and enterprises; (PR17) To create intelligent and adaptive systems of automated management and control of the technical condition of electromechanical equipment based on the use of programmable logic controllers

2. Prerequisites and post requisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

Prerequisites:

To successfully master the "Practice" discipline, you must have basic knowledge of the following disciplines:

1. NORMATIVE educational components

1.1. Cycle of general training

3O01 Intellectual property and patent science

3O02 Fundamentals of engineering and technology of sustainable development

3O03 Practical foreign language course for business communication

3O04 Management of startup projects

1.2. Cycle of professional training

PO01 Engineering of electrical and mechatronic systems

PO02 Intelligent decision-making systems

PO03 Automated design systems of electromechanical systems and complexes

PO04 Reliability of electrical and mechatronic systems

PO05 Computer control of technological processes, experiments, equipment

PO06 Virtual instruments of engineering research

PO07 Fundamentals of scientific research

PO08 Engineering of electrotechnical and mechatronic systems. Course project

Post-requisites:

The knowledge gained by students while studying the discipline is used in the following discipline:

PO 10 Execution of a master's thesis

3. Content of the academic discipline

The content and sequence of practice are determined by the topic of the master's thesis. During the internship, the student must collect the full amount of information that will be used by him during the writing of the master's thesis.

These can be works related to circuit-technical or construction-technological design (research) of individual functional units of specific devices (devices, equipment), with the development and improvement of technological processes, algorithms and software in accordance with the profile of the specialty, etc.

Practice is carried out according to an individual plan. In the course of practice, the following types of work must be performed:

- familiarize yourself with the main literary sources on the issues included in the practice program, make a short analytical review of the studied scientific materials;

- justify the topic of research and development, its relevance, novelty and perspective;

- to participate in research, design and technological developments, which are carried out on the basis of practice on the topic of the future diploma project.

- to learn the rules for drawing up technical documentation in accordance with the system of Ukrainian standards.

During the practice, the student must collect the source material according to the sections of the master's thesis. The structure of the master's thesis may consist of general sections and a special part, while the list of general sections may vary depending on the topic of the master's thesis. General sections include: general technical part, power supply, technological part, automation, labor protection. They contain materials that will be needed to complete the master's thesis, regardless of the content of the special section.

At the same time, the student's qualification work is primarily evaluated by the completeness and quality of solving the questions of the special section. The main efforts of the student should be directed to this. The complete list of materials required for the completion of a special section of the master's thesis is drawn up by the student and supervisor and specified at the beginning of the internship, that is, it is individual in nature.

The main document that testifies to the student's implementation of the internship program is a written report. The content of the report should reveal the student's knowledge and skills, acquired by him in solving the issues determined by the goal and task of the practice.

4. 4. Training materials and resources

Basic literature

1. Handbook of Industrial Automation. Richard L. Shell, Ernest L. Halledited, editors. Marcel Dekker,Inc., 2000. – 857 p.
2. Industrial Automation. IDC Engineers & bookboon.com, 2012. 205 p., ISBN 978-87-403-0004-8.
3. Frank Lamb. Industrial Automation: Hands-On. Copyright © 2013 by McGraw-Hill Education. ISBN: 978-0-07-181647-2. 369 p.
4. Au. Hughes, B. Drury. Electric motors and drives. Fundamentals, types and applications. Newnes. – 1368 p.
5. Electric Power Generation, Transmission, and Distribution. Leonard L. Grigsby, Ed. 2006 by Taylor & Francis Group, LLC. – 503 p.
6. E. Acha, V.G. Agelidis, O. Anaya-Lara, T.J.E. Miller. Power electronic control in electrical systems. Newnes. – 451 p.
7. Marek Sokolski. Mining Machines and Earth-Moving Equipment. Springer. – 2020, 226 p.
8. George E. Totten. Handbook of Hydraulic Fluid Technology, Second Edition / George E. Totten, Victor J. De Negri. – CRC Press, 2011. – 982 p.

Additional literature

1. Balbir S. Dhillon. Mining Equipment Reliability, Maintainability, and Safety. Springer. – 2008, 201 p.
2. Sydney Ferris Walker. Mining and Mining Machinery. Creative Media Partners, LLC, 152 p.
3. Steven F. Barrett and Daniel J. Pack. Microcontrollers Fundamentals for Engineers and Scientists. Copyright ©2006 by Morgan & Claypool. 126 p. DOI 10.2200/S00025ED1V01Y200605DCS001
4. E. Kuffel, W.S. Zaengl, J. Kuffel, High Voltage Engineering. Fundamentals. Newnes. – 552 p.
5. G. Olsson, G. Piani. Computer systems for automation and control. Prentice Hall International Ltd.London, 497 p.

Information resources

http://aemk.kpi.ua

Educational content

5. Methods of mastering the discipline (educational component)

5.1. Practice organization and management

Practice is organized by the practice manager from the university together with the supervisors of the master's theses of the intern students. General control over the practice is carried out by the head of the graduation department. A week before the start of practice, an instructional gathering of students is held, to which practice managers from the department are invited. At these meetings, students are informed of the requirements for the preparation of relevant documents for the internship. Students get acquainted with the essence of preparatory work, practice and defense of its results. Each student undergoes practice according to an individual plan, where the scope of work and the schedule of their execution are determined.

After the internship, the supervisor of the internship from the department gives feedback and evaluation of the student's work during the internship period. The practice report is defended before the commission in the last week of the practice. After the defense, the practice report is handed over to the head of the department's laboratories. A student who did not fulfill the requirements for practice, received negative feedback, did not prepare a report in accordance with the requirements for practice credit is not allowed.

5.2. The structure and content of the practice report

The practice report is the result of the student's independent engineering creativity. It is compiled individually during the internship period. The report must be submitted 2-3 days before the end of the internship for review by the supervisor of the master's thesis, who gives a brief feedback on the student's work.

The text part of the report is usually accompanied by drawings, diagrams, photographs, sketches, technical documentation forms, etc. Copying general provisions from manuals and instructions into the report is inadmissible. The scope of the practice report, including illustrations, is 20-30 pages. The practice report must comply with the requirements for the reports of the National People's Republic of Ukraine / DSTU 3008-95 State Standard of Ukraine. Documentation. Reports in the field of science and technology. Structure and design rules.

The reports of students who did not complete the internship program or received an unsatisfactory description of the work during the internship are evaluated as unsatisfactory.

Mandatory structural elements of the report include:
- title page;
- content;
- introduction;
- main part;
- conclusions and recommendations;
- references.

Політика та контроль

7. Policy of academic discipline (educational component)

At the time of the start of the pre-diploma practice, the student must have the Zoom application installed on the device from which he works (in the case of distance learning), and also open the ClassRoom "Practice" on the "Sikorsky" platform (the access code to the course is provided during the

practice instruction) . Documentation related to practice is posted on the "Sikorsky" platform and in the "KPI Electronic Campus" system.

During the internship, students are obliged to adhere to the general moral principles and rules of ethical behavior specified in the Code of Honor of the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute".

All students, without exception, are obliged to comply with the requirements of the Regulations on the Academic Plagiarism Prevention System at the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute".

8. Types of control and rating system for evaluating learning outcomes (RSO)

The main tasks of practice are reflected in the Practice Diary, which is kept according to the form approved by KPI named after Igor Sikorsky. The student makes notes in the Diary - records the content and scope of the work performed, as well as its results - during the entire practice. The actual implementation is certified by the head of practice from the enterprise.

The result of the internship should be obtaining results that will be used in the further development of the intern, on the basis of which the topic of the master's thesis will be clarified, and will be the basis for its writing. The results are drawn up in the form of a Pre-Diploma Practice Report.

At the end of the internship, the manager of the enterprise prepares feedback on the implementation of the internship program. The Written Report, together with the Practice Diary, is submitted for review to the immediate supervisor of the practice from the department within the term determined by the department and regulated by regulatory and methodical documents on the organization and conduct of practice.

The report submitted to the department in accordance with the established procedure at the department is checked by the head of practice from the department. If the results of the inspection of the report reveal its compliance with the established requirements, the report is recommended for defense before the commission.

In the case of detection of unfulfilled works, non-compliance with requirements, the report is sent for revision. According to the results of checking the report, the direct head of practice from the department determines the assessment with which the report is recommended for defense before the commission. The practice manager's assessment is advisory only and is not a binding defense assessment for the panel.

The main document that testifies to the student's implementation of the internship program is the report. The content of the report should reveal the student's knowledge and skills, acquired by him in solving the issues determined by the goal and task of the practice.

According to the results of the practice, a score is made. In the case of distance learning, it takes place online using Zoom in front of commission members. Attestation based on the results of practice is

carried out on the basis of a written report and diary of practice, drawn up in accordance with the established requirements, and feedback from the head of practice.

The student's rating for practice consists of the points he receives for:

1. internship at a university, enterprise or research institution;

2. practice report;

3. the answer in the credit lesson.

8.1. Internship at a university, enterprise or research institution

R1 - The weighted score is 30 points. Points are issued by the internship manager from the enterprise or research institution after the internship. The evaluation criteria are listed in Table 1.

Table 1

Points	Evaluation criteria
27 – 30	a fully completed individual task from the head of the practice from the company, regular communication with the head, timely completed diary
23 – 26	did not complete an individual task in full, fills out and sends the practice diary to the manager in a timely manner;
18 – 22	completed part of the individual task (less than 60%), fills in and sends the practice diary irregularly;

8.2. Practice report

R2 - The weighted score is 30 points. Points are issued by the internship manager from the enterprise or research institution after the internship. The evaluation criteria are listed in Table 2.

Table 2

Points	Evaluation criteria
27 – 30	drawing up a report without comments or with minor comments;
23 – 26	drawing up the report in the presence of errors and remarks of a principled nature and remarks about the literacy and neatness of the drawing;
18 – 22	preparation of a report with a large number of errors and remarks of a principled nature with illiterate and sloppy preparation.

A necessary condition for a student's admission to the credit is the condition: R1+ R2 ≥ 40

Calculation of the value (R) of the student rating::

The sum of the weighted points of the control measures is:

$$R\Sigma = R1 + R2 + R3,$$

where

R1- Internship at a university, enterprise or research institution

R2- Report on practice

R3- Protection on the test

8.3. Criteria of differentiated credit assessment

The weighted score is 40 points. The evaluation criteria are listed in Table 3.

Table 3

Points	Evaluation criteria
36 – 40	complete and correct answers to all questions, a sufficiently deep understanding of the material involved, the ability to use the acquired knowledge related to an individual task in practice
30 – 35	insufficiently complete answers to all questions, insufficient deep understanding of the involved material, insufficient ability to use acquired knowledge related to an individual task in practice
24 – 29	partial answers to all questions, insufficient deep understanding of the involved material, insufficient ability to use acquired knowledge related to an individual task in practice

The maximum value of **RΣmax** can be **100** points:

RΣmax= R1max + R2max + R3max = 30 + 30 + 40 = 100.

The minimum value of **RΣmin** under the condition of admission to the credit can be **60** points:

RΣmin= R1min + R2min + R3min = 20 + 20 +20= 60.

The size of the credit module rating scale is **100** points.

The obtained points are converted into traditional grades according to the table. 4.

Table 4

Points	Traditional assessment
100…95	Perfectly
94…85	Very good
84…75	Good
74…65	Satisfactorily
64…60	Sufficiently
40…59	Unsatisfactorily
< 40	Not allowed

The assessment for practice is entered in the student's assessment and examination report and in the student's assessment book and is taken into account when determining the scholarship together with the assessments based on the results of the final semester control.

Work program of the discipline (syllabus):
Compiled by Ph.D., Assoc. Prof. Gorodetskyi Viktor G.
Approved by the Department of Automation of Electrical and Mechatronic Complexes
(Protocol № 17 of 31.05.2023)
Approved by the Methodical Commission of the IEE Institute (Protocol № 9 of 22.06.2023)