



# Labour Protection and Civil Safety

## Working program of the academic discipline (Syllabus)

### Details of the academic discipline

<b>Level of high education</b>	<i>Bachelor</i>
<b>Branch of knowledge</b>	<i>14 Electrical engineering</i>
<b>Specialty</b>	<i>141 Electric Power Engineering, Electrical Engineering and Electromechanics</i>
<b>Educational program</b>	<i>ENERGY MANAGEMENT AND ENERGY EFFICIENT TECHNOLOGIES</i>
<b>Status of the discipline</b>	<i>Normative</i>
<b>Learning form</b>	<i>full-time (day)</i>
<b>Semester</b>	<i>Fourth year, seventh semester</i>
<b>Course scope</b>	<i>120 hours / 4 ECTS credits (lectures - 36 hours, practical classes - 28 hours ,laboratory works -8 hours, IWS - 48 hours)</i>
<b>Semester control / control measures</b>	<i>Set-off (Test), module control work (MCW)</i>
<b>Schedule</b>	<i><a href="http://roz.kpi.ua/">http://roz.kpi.ua/</a></i>
<b>Language</b>	<i>Ukrainian</i>
<b>Information about course supervisor and lecturers</b>	<i>Lecturer: Larysa Tretiakova, DS, Professor, email:larisa.tretiakova@ill.kpi.ua;+38(050) 357-27-77 (Telegram) - during working hours. Consultations: every Wednesday, 14:00-15:00 Practice supervisor: Larysa Tretiakova, DS, Professor Laboratory supervisor: Larysa Tretiakova, DS, Professor email:larisa.tretiakova@ill.kpi.ua;+38(050) 357-27-77 (Telegram) - during working hours. Consultations (tutorials): every Wednesday, 14:00-15:00</i>
<b>Course placement</b>	<i>Network management platform Платформа Sikorsky, Moodle, курс xq24sm://do.ipk.kpi.ua</i>

### Curriculum of the discipline

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

*The discipline belongs to the cycle of basic education.*

*Having mastered the material of the discipline, applicants for higher education will be able to use in their professional activities the provisions of legislative acts and regulations on occupational and civil safety; assess sanitary and hygienic conditions and level of safety; identify harmful and dangerous*

factors in the domestic and social environment; have the basic methods of saving life and health, including in emergencies. Students will gain knowledge of the basics of life and occupational and civil safety; labor management; economic and marketing components of occupational safety; basic provisions of fire safety; procedure for action in emergency situations, special, state of emergency and martial law. They will also be able to choose and use means of collective and personal protection; provide assistance and advice on practical safety issues; provide first aid; consciously act during evacuation measures.

### **The purpose of the credit module**

Formation of future specialists' awareness of the need and competencies to solve in primary positions typical tasks of all areas of professional activity with mandatory compliance with labor safety requirements and standards, responsibility for personal and collective safety in everyday conditions and during emergencies, special and martial law.

### **The subject of the credit module:**

Legislative, normative-legal, socio-economic, engineering-technical and sanitary-hygienic bases of life safety, labor safety and civil protection. Particular attention is paid to the functions of future bachelors in the field of occupational safety in primary positions, sanitary and hygienic requirements for working with computers and the rights, responsibilities and behavior of the population in emergencies, special and martial law.

## **2. Program learning outcomes**

Competences: (GC 02) Ability to apply knowledge in practical situations; (GC 07) Ability to work in a team.; (PC 08) Ability to perform professional duties in compliance with the requirements of the rules of safety, labor protection, industrial sanitation and environmental protection; (PC 11) Ability to quickly take effective measures in emergency (accident) situations in electric power and electromechanical systems.

Program **learning** Outcomes: (PLO 12) Understand the basic principles and tasks of technical and environmental safety of electrical engineering and electromechanics objects, take them into account when making decisions; (PLO 16) Know the requirements of regulatory acts related to engineering, intellectual property protection, occupational health and safety, safety and industrial sanitation, take them into account when making decisions.

## **3. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to the relevant educational program).**

Preliminary successful mastering of knowledge and skills in the following disciplines is required: "Electrical Equipment of Electric Power Plants and Substations", "Power Supply Systems", "Fundamentals of Metrology and Electrical Measurements", "Industrial Ecology", as well as the "Practical Foreign Language Course for Professional Purposes", since some of the literature on the discipline is written in English.

The results of the study of the discipline "Discrete control systems of actuators" are necessary for Pre-diploma Practice

## **4. The Content of the discipline**

### **Labour Protection and Civil Safety**

#### **Section 1. Life safety.**

Topic 1. Introduction. Course structure. Basic concepts and definitions.

Topic 2. Emergency situations: causes and classification.

Topic 3. Risk-oriented method of assessment of industrial hazards and emergency situations.

## **Section 2. Occupational safety.**

Topic 4. Legal and organizational foundations of labor protection.

Topic 5. Occupational hygiene and industrial sanitation.

Topic 6. Personal protective equipment.

Topic 7. Production and industrial safety. Electrical safety.

## **Section 3. Civil safety and fire safety.**

Topic 8. Emergency situations of man-made origin.

Topic 9. Fire and explosive safety.

Topic 10. Emergency situations of military origin

## **5. Educational materials and resources**

### **Basic literature**

1. Охорона праці та цивільний захист: підручник / О.Г. Левченко та ін.; Київ, нац. техн. ун-т України «КПІ ім. Ігоря Сікорського». Київ: Основа, 2019. 472 с.

2. Охорона праці та промислова безпека: навч. посіб. / К.Н. Ткачук, Л.Д. Третьякова та ін.; Київ, нац. тех. ун-т України «КПІ ім. Ігоря Сікорського». Київ: Лібра, 2010. 558 с.

3. Зацарний В.В., Праховнік Н.А., Землянська О.В., Зацарна О.В. Безпека життєдіяльності: навч. посіб. Київ, нац. тех. ун-т України «КПІ ім. Ігоря Сікорського». Київ: НТУУ «КПІ», 2016. URL: // <http://ela.kpi.ua/kandle/123456789/18263/>.

4. Голінько В.І., Третьякова Л.Д., Чеберячко С.І., Мітюк Л.О. Методи оцінювання та управління професійними ризиками у виготовленні та використанні засобів індивідуального захисту: монографія. Київ: Основа, 2021. 320 с. <https://ela.kpi.ua/handle/123456789/48829>

5. Третьякова Л.Д., Бориченко О.В., Мітюк Л.О. Системи штучного виробничого освітлення: безпека та енергоаудит: навч. посіб. Київ: КПІ ім. І. Сікорського 2023. 86 с URL: <https://ela.kpi.ua/handle/123456789/63861>

6. Третьякова Л.Д., Мітюк Л.О. Ризик-орієнтований підхід до вибору засобів індивідуального захисту органів зору: навч. посіб. Київ: КПІ ім. І. Сікорського 2024. 66 с. URL: <https://ela.kpi.ua/handle/123456789/63860>

### **Additional literature**

*(optional / familiarization)*

7. Третьякова Л.Д., Литвиненко Г.Є. Засоби індивідуального захисту: виготовлення та застосування: навч. посіб. Київ, нац. тех. ун-т України «КПІ ім. Ігоря Сікорського». Київ: Лібра, 2008. 320 с.
8. Голінько В.І., Третьякова Л.Д., Чеберячко С.І. Проектування засобів індивідуального захисту працюючих: навч. посіб. Державний ВНЗ «НГУ». Дніпро, НГУ, 2017. 181 с.
9. Третьякова Л.Д., Селіверстов А.Є. Новітні рішення проблеми індивідуального захисту працівників атомних електричних станцій: монографія. Київ: Основа, 2016. 197 с.
10. Здановський В.Г., Кружилко О.Є. Наукові розробки ризик-орієнтованого підходу у галузі охорони праці: монографія. Суми: Університетська книга, 2020. 384 с.
11. Каштанов С.Ф. Сучасне законодавство з безпеки промислового обладнання та продукції: монографія. Piga, Lap Lambert Academic Publishing, 2018. 136 с.
12. Зацарний В.В., Третьякова Л.Д. Безпека людини у сучасних умовах: монографія. Харків, ФОП Мезина, 2018. 208 с.
13. Правила улаштування електроустановок (ПУЕ-2017). Вид. офіц. Харків: Форт, 2018. 458 с.
14. ДНАОП 1.1.10-1.01-97. Правила безпечної експлуатації електроустановок споживачів напругою до 500 кВ. Вид. офіц. Київ: Міністерство енергетики, 1998. 105 с.
15. ДНАОП 0.00-1.21-98. Правила безпечної експлуатації електроустановок споживачів напругою до 220 кВ. Вид. офіц. Київ: Міністерство енергетики, 1998. 55 с.
16. ДСН 3.3.6.042-99. Державні санітарні норми мікроклімату виробничих приміщень. Вид. офіц. Київ: Держстандарт України, 1999. 56 с.
17. ДСанПіН 3.3.2.007-98. Державні санітарні правила і норми роботи з візуальними дисплейними терміналами електронно-обчислювальних машин. Вид. офіц. Київ: Держстандарт України, 1998. 26 с.

18. ГН 3.3.5-8-6.6.1-2014. Гігієнічна класифікація праці за показниками шкідливості та небезпечності факторів виробничого середовища, важкості та напруженості трудового процесу: наказ від 08.04.2014.м. N 248. Вид. офіц. Київ: Держнаглядохоронпраці, 2014. 85 с.
19. ДСанПІН 3.3.6.096-2002. Державні санітарні норми і правила при роботі з джерелами електромагнітних полів. Вид. офіц. Київ: Держнаглядохоронпраці, 2002. 38 с.
20. Safety and Health at Work. International Labour Organization, 2017. <http://www.ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm>
21. MIL-STD-882E. (2012). Department of defense standard practice.system safety. Available at: <https://assist.dla.mil>.

*The literature, the bibliography of which is given with a reference, can be found on the Internet. Literature without references can be found in the library of Igor Sikorsky Kyiv Polytechnic Institute. The basic literature [1-6] is recommended for reading. The connection of these resources with specific topics of the discipline is given below, in the methodology for mastering the discipline. All other literary sources are optional and are recommended to be reviewed.*

## **Educational content**

### **6. Methods of mastering an educational discipline (educational component)**

*The educational discipline includes 36 hours of lectures, 36 hours of practical classes, as well as the completion of a modular control work (MCW), which consists of two parts (by topic), lasting 1 acad. hours each*

*Practical classes in the discipline are conducted with the aim of consolidating the theoretical provisions of the academic discipline and acquiring the skills and practical experience of students to operate with modern concepts in the field of labor protection and civil protection. Based on the distribution of time for studying the discipline, fourteen practical classes (including time for MCW) and four laboratory works are recommended.*

*Teaching methods and forms include not only traditional university lectures and seminar activities, but also elements of teamwork and group discussions. Active learning strategies are applied, which are determined by the following methods and technologies: problem-based learning methods (research method); personal-oriented technologies based on such forms and methods of learning as case technology and project technology; visualization and information and communication technologies, including electronic presentations for lectures. Communication with the teacher is built using the "Electronic Campus" information system, the "Sikorsky" distance learning platform based on G Suite for Education, as well as such communication tools as e-mail and Telegram. During training and for interaction with students, modern information and communication and network technologies are used to solve educational tasks.*

### **Lecture classes**

<i>n</i>	<i>The name of the topic of the lecture and a list of main questions (list of didactic tools, links to information sources)</i>
<b>Section 1. Life safety as a basic concept of sustainable development</b>	
<b>1</b>	<p><b>Topic 1. Introduction. Course structure. Basic concepts and definitions.</b>  <i>Basic concepts in the field of life safety, labor protection, civil protection. Terminology and definitions. International program of sustainable development. The main goals and objectives in the field of health protection of employees. Production sources of danger, dangerous and harmful factors.</i>  <i>Literary sources: [3, 4]</i></p>

n	The name of the topic of the lecture and a list of main questions (list of didactic tools, links to information sources)
2	<p><b>Topic 2. Emergency situations: causes and classification.</b>  The "human-technogenic-living environment" system. Emergency situations of technogenic, natural and social origin: causes and classification.  Literary sources: [3, 4, 11, 12]</p>
3	<p><b>Topic 3. Risk-oriented method of assessment of industrial hazards and emergency situations.</b>  Risk as an indicator of hazard assessment. Definition of the concepts of "danger" and "risk". General risk assessment at the workplace. Types of risks. The concept of "acceptable risk".  Literary sources: [3, 4, 11, 12]</p>
4	<p><b>Topic 3. Risk-oriented method of assessment of industrial hazards and emergency situations.</b>  Hazard classification. Risk assessment. Categories of severity of consequences. The level of probability of occurrence of hazards. Ranking of risks. Risk management strategy. Reduction of occupational risk through the implementation of preventive measures.  Literary sources: [3, 4, 11, 12]</p>
<b>Section 2. Occupational health and safety</b>	
5	<p><b>Topic 4. Legal and organizational foundations of labor protection.</b>  Legislation of the European Union and Ukraine in the field of labor protection and industrial safety. State Department of Labor Protection. The main provisions of the state social insurance against accidents at work and occupational diseases. Organization of labor protection at the enterprise.  Literary sources: [3, 4, 10, 13]</p>
6	<p><b>Topic 5. Occupational hygiene and industrial sanitation.</b>  General characteristics of working conditions in production. Requirements for production, auxiliary and premises with electrical installations. Requirements for the organization of the workplace. Requirements for organizing a workplace with a computer. Analysis of working conditions at energy enterprises. Peculiarities of working conditions at a computerized workplace  Literary sources: [3, 8 ]</p>
7	<p><b>Topic 5. Occupational hygiene and industrial sanitation.</b>  Methods of regulating the microclimate and the quality of the industrial air environment. Indicators and regulation of natural and artificial lighting of industrial premises  Literary sources: [5, 11]</p>
8	<p><b>Topic 5. Occupational hygiene and industrial sanitation.</b>  The main characteristics of noise, vibrations, ultra- and infrasound. The effect of noise on a person. Regulation, control and measurement of noise. Features of the occurrence of noise and vibrations in electrical installations. Ionizing radiation in electrical installations. Effects of ionizing radiation on humans. Indicators and standardization of ionizing radiation.  Methods of monitoring at the workplace</p>

n	The name of the topic of the lecture and a list of main questions (list of didactic tools, links to information sources)
	<i>Literary sources: [5, 11]</i>
9	<p><b>Topic 6. Personal protective equipment.</b>  <i>Classification of personal protective equipment. Basic requirements for personal protective equipment. Recommendations for the selection and use of protective clothing, means of personal protection for the head, eyes, hands, organs of hearing and breathing</i>  <i>Literary sources: [4, 6, 7]</i></p>
10	<p><b>Topic 7. Production and industrial safety. Electrical safety.</b>  <i>The urgency of the problem of electrical safety. General characteristics of electrical installations and thermal power equipment. Characteristics of regulatory documents on electrical safety and pressure vessels. Features of electrotraumatism.</i>  <i>Literary sources: [3, 10]</i></p>
11	<p><b>Topic 7. Production and industrial safety. Electrical safety.</b>  <i>The main dangers of operating electrical installations (definition). Effect of electric current and electromagnetic field of industrial frequency on a person. Theoretical bases of the occurrence of danger during the use of electrical installations. Basic characteristics and normalization of the electromagnetic field of industrial frequency.</i>  <i>Literary sources: [3, 11]</i></p>
12	<p><b>Topic 7. Production and industrial safety. Electrical safety.</b>  <i>Classification of technical methods of protection against direct contact in electrical installations. Electrical insulation in electrical installations: materials, characteristics, calculation, requirements and methods of measuring insulation of electrical installations. Protective means. Methods of safe placement of current-carrying parts. Means of safety blocking in electrical installations. Orientation in electrical installations.</i>  <i>Literary sources: [3, 15]</i></p>
13	<p><b>Topic 7. Production and industrial safety. Electrical safety.</b>  <i>Classification of methods of protection against indirect contact and step voltage in electrical installations. The principle of protective action of protective grounding in electrical networks. Design of grounding devices. Requirements for grounding devices in electrical installations. Calculation method of the grounding device. Protective automatic shutdown. Protective equalization of potentials. Isolation zones. Ultra-low (low) voltage systems.</i>  <i>Literary sources: [3, 15]</i></p>
14	<p><b>Topic 7. Production and industrial safety. Electrical safety.</b>  <i>Organization of safe operation of electrical installations. Requirements for employees who maintain electrical installations. Procedure for operation of operating electrical installations. Organizational measures during operation of operating electrical installations. Certification of the state of safety of electrical installations. Examination of consumers' electrical installations.</i>  <i>Means of personal protection in electrical installations.</i>  <i>Literary sources: [3, 15]</i></p>
<b>Section 3. Civil safety and fire safety.</b>	
15	<p><b>Topic 8. Emergency situations of man-made origin.</b>  <i>Types of man-made emergency situations. Stages of liquidation of emergency situations. Accidents at radiation-hazardous objects: causes, development,</i></p>

n	The name of the topic of the lecture and a list of main questions (list of didactic tools, links to information sources)
	consequences. Protection system at radiation-hazardous objects. Accidents at chemically hazardous facilities. Literary sources: [3, 8, 12]
16	<b>Topic 9. Fire and explosive safety.</b> Flammability groups of substances. Categories of premises and buildings. Classification of explosive and fire-hazardous premises. Explosion and fire prevention system. Requirements for electrical installations in fire-hazardous and explosive-fire zones. Electrostatic spark safety measures in explosive and fire-hazardous areas. Equipping power facilities with primary fire extinguishing equipment. Literary sources: [3, 4, 14]
17	<b>Topic 9. Fire and explosive safety.</b> Risk-oriented approach to fire safety. Factors affecting the risks of fires and explosions. Physical basis of lightning manifestation. Lightning protection of buildings and structures. Classification of buildings and structures according to the level of lightning protection. Design features of the lightning conductor. Lightning protection design methods. Literary sources: [3, 11]
18	<b>Topic 10. Emergency situations of military origin.</b> Peculiarities of emergency situations during military operations on the territory of Ukraine. Preparation and evacuation from the occupied territories. Methods of protection during missile and artillery attacks. Characteristics of combat poisonous chemical substances. Ways of protection while being in the zone of influence of poisonous chemicals. Literary sources: [3, 6]

### Practical training

n	Name of the subject of the practical lesson and list of main questions (list of didactic tools, links to information sources)
1	<b>Topic 2. Impact of impressive, dangerous and harmful factors on human health.</b> Conducting informational work in abstract and presentational form on the impact of the most common affecting, dangerous and harmful professional factors. Literary sources: [1, 2]
2	<b>Topic 3. Hazard Assessment and Risk Identification</b> Methods of analysis of the occurrence of hazards depending on the type of professional activity; lifestyle (the main causes of additional risk), place of residence and possible erroneous actions of the employee. A variant of the technical system is selected, for which a qualitative analysis of the risk of hazards during its operation will be carried out. Based on the results of the qualitative analysis, the hazard for which a quantitative risk assessment is performed is selected. Literary sources: [1, 2]
3	<b>Topic 5. General principles of first aid to victims</b> Practical methods of providing first aid to victims who have received the most common injuries (burns, cuts, falls) or acute illnesses (electric shock, chemical poisoning) are considered. The work consists in solving practical problems, each of which describes the situation of a person's injury. It is necessary to classify the injury (according to the

n	Name of the subject of the practical lesson and list of main questions (list of didactic tools, links to information sources)
	degree of severity, depending on the influencing factors, according to the form of manifestation) and develop a strategy for providing first aid to the victim. Literary sources: [2]
4	<b>Topic 5. Monitoring and ergonomic evaluation of the workplace.</b> Theoretical knowledge of the principles and methods of monitoring and ergonomic assessment of the workplace, practical skills in calculating the score before and after the measures taken to reduce hazards and improve ergonomic performance. Recommendations for optimizing the workplace are provided. Literary sources: [ 2, 5]
5	<b>Topic 5. Assessment and methods of air purification of the working area and thermal protection.</b> Theoretical knowledge of the main parameters of the air of the working area in working premises, practical skills in assessing them from the point of view of labor protection, get acquainted with the main measures aimed at improving the air environment and heat protection. Literary sources: [1, 2]
6	<b>Topic 5. Assessment and ways to ensure compliance with the requirements of labor protection of the parameters of noise, ultra-, infrasound at workplaces.</b> Practical knowledge of the methodology for assessing the parameters of noise, ultra- and infrasound, which occur at computerized workplaces in industrial premises, studying their effect on the human body, normalizing the parameters of these factors, familiarization with the main measures aimed at protecting workers from the negative effects of noise, ultra- and infrasound. Literary sources: [1, 2]
7	<b>Topic 5. Evaluation of parameters and indicators of natural and artificial lighting of industrial premises.</b> Practical knowledge of the methodology for assessing the parameters and indicators of natural and artificial lighting of office premises, determining the role of light in ensuring the safety of the production process, standardization of artificial and natural lighting. Study of methods of selection, construction of schemes and calculation of industrial lighting: working, duty, emergency, security. <b>Module control work 1</b> Literary sources: [1, 2]
8	<b>Topic 5. Methods for choosing a lighting system for industrial and administrative premises.</b> Study of methods of selection, construction of schemes and calculation of industrial lighting: working, duty, emergency, security. Literary sources: [1, 2]
9	<b>Topic 7. Calculation of protective grounding.</b> Students consolidate and deepen theoretical knowledge and acquire practical skills in calculating the resistance of a grounding device. Earthing is calculated in networks with a voltage of more than 1000 V and in networks with a voltage of up to 1000 V with a blindly grounded neutral. Literary sources: [1, 2]



n	Name of the subject of the practical lesson and list of main questions (list of didactic tools, links to information sources)
10	<p><b>Topic 9. Calculation of the lightning rod protection zone.</b></p> <p>Determination of the category of lightning protection, get acquainted with the purpose and design features of lightning protection, study the design of lightning protection devices, their placement and calculation methodology; Calculations of lightning protection elements and parameters of a lightning rod designed to protect against direct lightning strikes are carried out.</p> <p>Literary sources: [3]</p>
11	<p><b>Topic 9. Methodology for assessing and ensuring fire safety at an electric power facility.</b></p> <p>Methodology for determining the category and class of the area of premises by explosion and fire hazard, get acquainted with fire prevention measures (technical, organizational, personal protective equipment) of fires and fire protection.</p> <p>Literary sources: [2]</p>
12	<p><b>Topic 8. Forecasting and assessment of the consequences of explosions at an electric power facility.</b></p> <p>Solving typical problems of assessing the consequences of hazards during accidents at an explosive facility. After explaining the methodology of the work, each student performs the necessary calculations according to the initial data according to the individual version.</p> <p>Literary sources: [1, 3]</p>
13	<p><b>Topic 8. Forecasting and assessment of the radiation situation during an accident or missile attack on an electric power facility.</b></p> <p>Forecasting and assessment of the radiation situation; methods of operational, long-term forecasting; simulation of zones of radioactive contamination (contamination) of the area; determination of geometric parameters of zones; assessment of the probability of an electric power facility entering the infection zone and the duration of infection; Display of zones on the terrain plan (map). After explaining the methodology of the work, each student performs the necessary calculations according to the initial data of his version.</p> <p>Literary sources: [1, 3]</p>
14	<p><b>Topic 8. Assessment of the reliability of protection of employees of the object of economic activity on the use of protective structures in wartime.</b></p> <p>Determination of the most reliable way to protect people in emergency situations by sheltering them in specialized engineering structures: shelters and anti-missile shelters. Explanation of the basic rules of conduct during artillery, bomb and rocket attacks. After explaining the methodology of the work, each student performs the necessary calculations according to the initial data of his version.</p> <p><b>Module control work 2</b></p> <p>Literary sources: [1, 3]</p>

### **Laboratory training**

<i>n</i>	<i>Name of the subject of the practical lesson and list of main questions (list of didactic tools, links to information sources)</i>
1	<p><b>Topic 5. Artificial Electric Lighting Research.</b></p> <p><i>The purpose of the work: to get acquainted with the types and systems of lighting; to investigate visual working conditions by experimental and analytical methods; to investigate the normalized indicators that characterize artificial lighting in the conditions of the educational laboratory; acquire practical skills in the use of measuring instruments and regulatory documents; draw conclusions about improving the conditions of visual work.</i></p> <p><i>Laboratory stands and measuring instruments are used.</i></p> <p><i>Literary sources: [2]</i></p>
2	<p><b>Topic 7. Organizational measures during the current operation of existing electrical installations</b></p> <p><i>The purpose of the work: to get acquainted with the types of documents that allow you to carry out activities during the current operation of existing electrical installations. Fill out the appropriate authorization document depending on the type of planned work: work permit, order, document for current operation.</i></p> <p><i>Laboratory stands, forms of permits, and a journal of work registration are used.</i></p> <p><i>Literary sources: [ 2]</i></p>
3	<p><b>Topic 7. Features of the use of ESR5 series safety relays in control systems of electrical installations.</b></p> <p><i>The aim of the work is to determine the main features of the functioning and application of ESR5 series protective relays in the safety management systems of industrial equipment, developed using new innovative technologies by the EATON electrotechnical group, to assess the compliance of the algorithm of operation of an electrical installation or heat and power equipment with the existing safety requirements for the performance of the following functions: monitoring the condition of movable protective barriers (fences); guaranteed blocking of the movable protective barrier (fence), emergency shutdown of production equipment; prevention of uncontrolled start-up or re-restart of production equipment after its emergency shutdown or in the event of an unforeseen power outage.</i></p> <p><i>Laboratory stands and measuring instruments are used.</i></p> <p><i>Literary sources: [2]</i></p>
4	<p><b>Topic 7. Signaling Devices in Safety Management Systems of Electrical Installations</b></p> <p><i>The aim of the work is to study the alarm system as a means of warning the employee about the occurrence of certain possible events in the relevant production environment, the distribution of the alarm system by functional purpose into operational, warning and recognition.</i></p> <p><i>The student needs to investigate the algorithm of operation of the SLAC signal column (3-module light) and determine the type of light source in each of the 3 light modules and their operating modes, as well as classify the functional purpose of these light modules in accordance with the requirements of IEC/EN 60204-1, determine the mode of the acoustic module set using a DIP switch (type of sound signal), investigate the operating parameters of a signal light with a stroboscopic effect.</i></p> <p><i>Laboratory stands, measuring devices are used</i></p> <p><i>Literary sources: [ 2]</i></p>

## 7. Independent work of the student

*Independent work consists of the following types of activities: preparation for classroom lectures, practical classes; calculations based on primary data obtained in practical classes; writing an essay; doing homework. The plan for the distribution of hours by individual types of independent work is provided in Table 1.*

*Table 1. Hour distribution plan*

<i>Type of independent work</i>	<i>Total hours</i>
<i>Preparing for classroom lessons</i>	<i>38</i>
<i>Preparing for the MCW</i>	<i>4</i>
<i>Set-off/Test/survey</i>	<i>6</i>
<i>Totally</i>	<i>48</i>

## Policy and control

### 8. Policy of educational discipline

*The system of requirements that the teacher puts before the student:*

- rules of attendance: in accordance with Order 1-273 of 14.09.2020, it is prohibited to assess the presence or absence of the applicant in the classroom, including the accrual of incentive or penalty points. According to the RSO of this discipline, points are awarded for the relevant types of educational activity in lectures and practical classes.*

*At the beginning of each class, both lecture and practical, the student must have the Zoom application installed on the device from which he or she is working (in the case of distance learning), and the course "Energy Management. Part 1" on the Sikorsky platform (the course access code is provided at the first lesson according to the schedule). Silabus; lecture material; workshop; assignments for practical classes; options for module tests; express tests to be completed during lectures; a list of questions for the exam is available on the Sikorsky platform and in the KPI Electronic Campus system.*

- rules of behavior in the classroom: the student has the opportunity to receive points for the relevant types of learning activities in lectures and practical classes provided for by the discipline's RSO. The use of communication tools to search for information on the teacher's Google Drive, on the Internet, in a distance course on the Sikorsky platform is subject to the instruction of the teacher;*
- rules for the protection of individual tasks: the curriculum does not provide for individual tasks;*
- rules for awarding incentive and penalty points: incentive and penalty points are not included in the main RSO scale, and their total does not exceed 10% of the maximum number of points. The total amount of incentive points cannot exceed 10 points. Incentive points are awarded for participation in scientific conferences, student competitions and Olympiads, for writing an article and its publication. For participating in the All-Ukrainian Olympiad (research paper competition), a student is awarded 5 (I round) or 10 (II round) points. For writing an article and publishing it, a student is awarded 10 points (a publication included in Scopus or Web of Science) or 8 points (a professional publication of Ukraine). For publishing an abstract at a scientific conference, 5 points are awarded.*
- deadlines and retakes policy: each student is responsible for meeting the deadlines for completing tasks within the schedule of classroom classes in the discipline. The mandatory control measure of assessment for admission to the exam is the MCW. A student who, for a valid reason (sick leave, academic mobility, etc.), has not written an MCW, has the right to do so during regular*

consultations with the teacher according to the schedule. The procedure for retaking the semester control is determined by the general rules of the university<sup>1</sup>.

- *policy on academic honesty: The Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute" <https://kpi.ua/files/honorcode.pdf> establishes general moral principles, rules of ethical behavior of persons and provides for a policy of academic honesty for persons working and studying at the university, which they should be guided by in their activities, including when studying and passing control measures in the discipline "Energy Management. Part 1". Teachers and students studying this discipline are committed to comply with the provisions of the Code of Honor adopted by the University<sup>2</sup>;*
- *when using digital tools for communication with the lecturer (mobile communication, e-mail, correspondence on forums and social networks, etc.), it is necessary to follow generally accepted ethical standards, in particular, to be polite and limit communication to the lecturer's working hours.*

**Inclusive education.** *The learning of knowledge and skills in the discipline can be accessible to most people with special educational needs, except for students with severe visual impairments that do not allow them to complete tasks using personal computers, laptops, and/or other technical tools.*

**Study in a foreign language.** *In the process of completing tasks, students may be recommended to refer to English references.*

### **1. Types of control and rating system for assessing learning outcomes (RSO)**

**Current control:** *express controls at lectures, MCWs, completion of tasks in practical classes.*

**Calendar control:** *conducted twice a semester as a monitoring of the current state of fulfillment of the requirements of the syllabus.*

**Semester control: Set-off (Text)**

*1. The student's rating in the discipline is calculated from 100 points, of which 60 points are the starting scale. The starting rating (during the semester) consists of points that the student receives for:*

- *express tests in lectures (16 points);*
- *completion of tasks in practical classes (64 points);*
- *writing an ICR (20 points).*

*2. Criteria for awarding points:*

*2.1 Express controls in lecture classes: weighted score - 2. The maximum number of points for express controls is 2 points \* 8 express controls = 16 points.*

*Express control is carried out in the form of tests that the student performs directly at the lecture, 5-10 minutes before the end of the lesson. At the end of the lesson, the tests are closed and cannot be rewritten or completed at home. The test contains six questions and several answers to each of them, one of which is correct. Each correct answer is worth 0.5 points.*

*2.2 Completion of tasks in practical classes: weighting point - 4. The maximum number of points for completing tasks in practical classes is 4 points \* 16 tasks = 64 points.*

---

<sup>1</sup> *Regulations on the current, calendar and semester control of learning outcomes at Igor Sikorsky Kyiv Polytechnic Institute (Annex 1 to Order No. 7-137 of August 0, 2020). URL: [https://kpi.ua/document\\_control](https://kpi.ua/document_control)*

<sup>2</sup> *Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute". URL: <https://kpi.ua/code>.*

During the practical classes, students together with the teacher solve problems on the topic of the practical class. After solving these tasks, students receive individual tasks that must be solved and submitted to the instructor for review at the end of the practical class.

Evaluation criterions:

- the task is solved correctly and handed in after the practical lesson - 4 points;
- the task is solved correctly, but submitted within one to two weeks after the practical lesson - 3 points;
- the task is solved with minor errors and handed in after the practical lesson - 2 point;
- the assignment is solved with minor errors and submitted within one to two weeks after the practical lesson - 1 points;
- the task is solved with significant errors and is returned for revision.

2.3. Writing a module control work: the weighting score for one MCW is 10. The maximum score for two MCWs is 20 points.

During the semester, one module control work is conducted, which is divided into two one-hour works, for each of which the following assessment criteria are established:

- full answer to theoretical questions, tasks solved correctly - 9-10 points
- answer to theoretical questions with minor flaws, minor errors in solving tasks – 6-8 points
- answer to theoretical questions with significant shortcomings, significant errors in solving tasks - 2-5 points
- unsatisfactory answer to theoretical questions, incorrect solution of tasks - 0 points

3. Calendar control: is conducted twice a semester as a monitoring of the current state of fulfillment of the requirements of the syllabus. The condition for a positive first and second calendar control is to obtain at least 50% of the maximum possible rating at the time of the relevant calendar control.

4. The condition for admission to the set-off is to write a module control work and a starting rating of at least 30 points.

5. At the set-off, students perform test. Test is evaluated at 40 points. The test consists of two difficulty levels. The first difficulty level contains twenty questions, each of which has several answers, only one correct. Each correct answer within the first level is worth 1 point. The second difficulty level involves solving 10 practical tasks and choosing the correct answer based on the results of the solution, and such a task is worth 2 points.

6. The sum of the starting points and the points for the test assignment is transferred to the final grade according to the table 2.

Table 2. Total number of points

Evaluation method	Number	Minimum score in points	Maximum score in points
Testing based on lecture materials	2	8	16
Completion of tasks for practical classes	16	32	68
MCP	2	10	20
Starting rating		60	100
Set-off (Test)	1	40	-
Final rating		100	100

For correspondence education

**Current control:** performance of tasks for practical classes (40 points) and MCP (20 points). The structure of MCP, practical work, tests, requirements for them and evaluation criteria are similar to those for full-time education and are given above.

**Semester control:** Set-off (test). Conditions for admission to the semester control: completed and credited MKR and tasks for practical classes and a starting rating of at least 60 points.

Students who have fulfilled the conditions for admission to credit, perform test tasks. Credit test tasks are valued at 40 points. The evaluation criteria are given above. The sum of starting points and points for the test assignment is transferred to the final grade according to the table 3.

Table 3. Correspondence of rating points to grades on the university scale

Number points	Assessment on the university scale
100-95	Perfectly
94-85	Very good
84-75	Good
74-65	Satisfactorily
64-60	Enough
Less 60	Unsatisfactorily
Admission conditions are not met	Not allowed

## 9. Additional information on the discipline (educational component)

List of topics that are submitted for semester control:

Topic 1. Introduction. Course structure. Basic concepts and definitions.

Topic 2. Emergency situations: causes and classification.

Topic 3. Risk-oriented method of assessment of industrial hazards and emergency situations.

Topic 4. Legal and organizational foundations of labor protection.

Topic 5. Occupational hygiene and industrial sanitation.

Topic 6. Personal protective equipment.

Topic 7. Production and industrial safety. Electrical safety.

Topic 8. Emergency situations of man-made origin.

Topic 9. Fire and explosive safety.

Topic 10. Emergency situations of military origin

The list of questions submitted for semester control is given in the appendix to the syllabus.

A student of higher education has the opportunity to take an online course(s) on one or more topics provided by the work program of the academic discipline. The applicant can choose an online course independently or on the recommendation of a teacher. 1 hour of the course is valued at 0.83 points. The maximum number of hours that can be credited for the results of non-formal education is 12 hours, accordingly the maximum number of points for such results is 10 points.

*For self-study, relatively simple questions are offered, which in most cases are descriptive in nature, designed to expand students' horizons and repeat materials studied in other disciplines, and are directly related to the discipline.*

**Working program of the academic discipline (syllabus):**

**Compiled by:**

Prof. Tretiakova L.

**Approved** by the Department of Labor protection, industrial and civil safety (protocol 9 to 22.05 2024).

**Approved** by the Methodical Commission of the Institute of Energy Saving and Energy Management (protocol 21 to 25.06. 2024).