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|  |  | **Кафедра автоматизації електротехнічних та мехатронних комплексів** |
| **Technical regulation, standardization and certification in the energy sector**  **Work program of the discipline (Syllabus)** | | |

# Requisites of the academic discipline

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| Degree of higher education | *Second (Master)* |
| Field of study | *14 Electric engineering* |
| Specialty | *141 Electric Power Engineering, Electrotechnics and Electromechanics* |
| Study program  Certificate program | *Engineering of Intellectual Electrotechnical and Mechatronic Complexes*  *Engineering and automation of hydrogen energy systems and technologies* |
| Status of the discipline | *Selective* |
| Form of study | *Full-time/part-time/distance learning* |
| Year of study, semester | *1st year of study/ spring semester* |
| Volume of the discipline | *5 credits 150 hours (36 lectures, 18 practical, 96 SSW)* |
| Semester control/ control activities | *Exam, MCW, calculation and graphic work* |
| Timetable | [*http://rozklad.kpi.ua/*](http://rozklad.kpi.ua/) |
| Language of study | *English* |
| Information about the course leader / teachers | Lecturer: associate professor, PhD, senior researcher, Anna V. Yakovlieva*,*  *tel. +38 063 630 89 59, e-mail: a.v.iakovlieva@lll.kpi.ua[[1]](#footnote-2)*  Practical lessons: *assistant Sofiia Dokshyna,*  *tel. +38 068 546 22 07, email: a.khotian@kpi.ua* |
| Placement of the course | Available on the Google Classroom platform. The access code is provided by the teacher at the first lesson. |
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# Program of the discipline

# Description of the discipline, its purpose, subject matter and learning outcomes

# The discipline "Technical Regulation, Standardization and Certification in Energy", like other special disciplines, performs both basic general educational and developmental and general educational functions, the essence of which is to form integrated knowledge and skills necessary for the future creative engineering activities of a specialist in bioenergy systems and technologies.

# The main purpose of the discipline "Technical regulation, standardization and certification in energy" is to study the regulatory, legal, technical and technological framework in the field of bioenergy.

# The subject of the discipline is technical regulation in the field of bioenergy.

# Program learning outcomes:

# The main objective of the discipline is to provide students with professional skills on the basis of practical and theoretical materials on the basic methodology and technology of organizing the rational use of biomass and its products.

# Program competencies:

# to use the legal, regulatory, technical, technological framework, theoretical knowledge to solve practical problems of engineering support for the rational use of biomass processing processes; automate technological processes; establish the relationship between the physical, chemical, operational and environmental properties of hydrogen; analyze technological processes, optimize them through automation; determine the most important, optimal technological parameters and justify optimal technological processes, determine the operating conditions for the rational use of biomass and create an infrastructure for the rational operation of technological equipmentequipment.

###### **2. Prerequisites and post-requisites of the discipline (place in the structural and logical scheme of study in the relevant educational program)**

# The discipline is based on students' knowledge of basic concepts in physics, mathematics, economics, philosophy, sociology, ecology and professional training disciplines aimed at acquiring skills of a systematic approach to the study and solution of current and future energy problems, rational use of energy resources and engineering and technological methods in solving specific practical situations, as well

# The competencies that students will acquire while studying this discipline should be applied by them in their master's thesis, as well as future engineering tasks in the field of energy, in particular, electrical engineering, renewable energy sources, alternative ways of generating electricity, alternative energy in general, etc.

# 3. Content of the discipline

# Section 1. Introduction to the course "Integrated use of the resource base of traditional and renewable energy":

# Topic 1.1. General concepts of energy resources, classification of the resource base of traditional and alternative energy sources.

# Topic 1.2. Composition of the Earth's energy system, forms of energy storage.

# Section 2. Raw material base of non-renewable (fossil) energy resources:

# Topic 2.1. Potential for the use of oil raw materials.

# Topic 2.2. Potential for the use of natural gas.

# Topic 2.3. Potential for the use of coal and lignite

# Topic 2.4. Potential for the use of peat and unconventional fossil fuels

# Topic 2.5. Potential for the production and use of nuclear energy.

# Section 3. Raw material base of renewable (alternative) energy resources:

# Topic 3.1. Potential for the use of solar energy.

# Topic 3.2. Potential for the use of wind energy.

# Topic 3.3: Potential for using the energy of the World Ocean.

# Topic 3.4. Potential for the use of hydropower energy.

# Topic 3.5. The potential for the use of geothermal energy.

# Topic 3.6. The potential for the use of biomass energy.

# Topic 3.7. Potential for the use of secondary raw materials.

# Topic 3.8. Potential for the use of hydrogen energy.4. Навчальні матеріали та ресурси

**Basic literature:**

1. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, [EUR-Lex - 32018L2001 - EN - EUR-Lex (europa.eu)](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018L2001)

2. Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC [EUR-Lex - 32009L0030 - EN - EUR-Lex (europa.eu)](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0030)

3. ISO 14001:2015 Environmental management systems — Requirements with guidance for use. [ISO 14001:2015 - Environmental management systems — Requirements with guidance for use](https://www.iso.org/standard/60857.html)

4. ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories. [ISO/IEC 17025:2005 - General requirements for the competence of testing and calibration laboratories](https://www.iso.org/standard/39883.html)

5. ISO 10012:2003 Measurement management systems — Requirements for measurement processes and measuring equipment. [ISO 10012:2003 – Measurement management systems — Requirements for measurement processes and measuring equipment](https://www.iso.org/standard/26033.html)

6. ISO 9000:2015 Quality management systems — Fundamentals and vocabulary. [ISO 9000:2015 - Quality management systems — Fundamentals and vocabulary](https://www.iso.org/standard/45481.html)

7. ASTM Energy Standards: Powering Our Lives. [energy\_overview\_2016.pdf (astm.org)](https://www.astm.org/media/files/about-overview/energy_overview_2016.pdf)

**Additional literature:**

4. Fundamentals of Chemmotology [Electronic resource] : manual / S. V. Boichenko, A. V. Yakovlieva, O. O. Vovk, M. M. Radomska, L. M. Cherniak, I. O. Shkilniuk ; National Aviation University. – Kyiv, 2019. – 296 p. <https://ela.kpi.ua/handle/123456789/49653>

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**Information resources:**

1. Distance learning course "Engineering and Technical Regulation in the Field of Hydrogen Production and Use" - <https://classroom.google.com/c/NTYyNzYxMzcxNTE0> ;

<https://classroom.google.com/c/NTg1OTI2OTkzMjU4> (distance learning).

# *The literature, the bibliography of which is given with a reference, can be found on the Internet. Literature that does not contain references can be found in the library of Igor Sikorsky Kyiv Polytechnic Institute. Some sections of the basic literature [1]-[5] are required reading. The sections of the basic literature that are required for reading, as well as the relationship of these resources to specific topics of the discipline, are given below in the methodology for mastering the discipline. All other literary sources are optional and are recommended to be read*

# Educational content

# 5. Methods of mastering the discipline (educational component)

Active learning strategies are applied, which are determined by the following methods and technologies: problem-based learning methods (research method); personality-oriented technologies based on such forms and methods of teaching as case technology and project technology; visualization and information and communication technologies, including electronic presentations for lectures. The methodology of teaching the discipline combines visual teaching methods with explanation. Teaching is conducted in the form of lectures, laboratory and practical classes. The problem-solving method is used in the calculation work.

**Lectures**

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| No | Title of the lecture topic and a list of key issues (references to literature) |
| 1 | **Lecture 1.** Topic 1.1. Basic terms and concepts of technical regulation.  **Literature: [1], [3], [5].** |
| 2 | **Lecture 2.** Topic 1.2. Basic principles of standardization and certification.  **Literature: [2] - [7].** |
| 3 | **Lecture 3-4.** Topic 1.3. Legislative framework and basics of technical regulation. Regulatory and legal support for the main directions of bioenergy development in Ukraine  **Literature: [1], [3], [4], [5].** |
| 4 | **Lecture 5.** Topic 1.4. Legal basis of standardization. Objects and methods of standardization. Features of the application of regulatory documents and the nature of their requirements  **Literature: [1], [3], [4].** |
| 5 | **Lecture 6-7:** Topic 1.5. Development and application of technical regulations (TR). Regulatory framework for technical regulations and stages of conformity assessment of products to the requirements of TR.  **Literature: [1], [3], 12.** |
| 6 | **Lecture 8.** Topic 2.1. Principles of energy sector regulation.  **Literature: [2], [6], [7].** |
| 7 | **Lecture 9-10.** Topic 2.2. Regulatory documents and the procedure for their development. Designation of regulatory documents. Procedure for drawing up, presenting and approving technical specifications for energy enterprises  **Literature: [2], [3], [5], [7].** |
| 8 | **Lecture 11.** Topic 2.3. Work of the standardization service at the enterprises of the energy complex. International and European activities of Ukraine in the field of standardization.  **Literature: [2], [3], [5], [7].** |
| 9 | **Lecture 12-13.** Topic 2.4. The theory of standardization of management systems, in particular, environmental management in the energy sector. Basic principles of the concept of total quality management.  **Literature: [2], [3], [5], [7].** |
| 10 | **Lecture 14-15.** Topic 3.1. Certification and conformity assessment. Accreditation. Basic information about conformity assessment. Legal basis for conformity assessment. Schemes, means and methods of conformity assessment  **Literature: [2], [3], [5], [7].** |
| 11 | **Lecture 16-17:** Topic 3.2. Quality control of products. Testing laboratories. Quality control of traditional and alternative fuels (raw materials and products). Current state of quality control of biofuels.  **Literature: [2], [3], [5], [7].** |
| 12 | **Lecture 18.** Topic 3.3: Declaration. Basic documents of conformity. Differences between a certificate and a declaration. Registration of the certificate of conformity and declaration  **Literature: [2], [6], [7]** |

**Practical lessons**

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| No | Tasks to be assigned for practical classes |
| **Practical lesson 1-2** | Subject and object of the discipline. Basic terms and concepts.  Practical skills in technical regulation |
| **Practical lesson 3-4** | Technical regulation and types of regulatory documents in the field of bioenergy. DSTU 7721:2015 "Gaseous fuels. Biogas. Technical requirements and control methods". |
| **Practical lesson 5-6** | Energy production by processing agricultural residues. Processing of energy crops |
| **Practical lesson 7-8** | Technological aspects of biogas production |
| **Practical lesson 9** | Examples of thermochemical processes of biomass processing.  Module control work |

# 6. Student's self-study

*Student’s self-study include:*

*Preparation for classroom lessons - 62 hours;*

*Completion of calculation and graphic work - 8 hours;*

*Preparation to module control work – 2 hours;*

*Preparation to exam – 24 hours.*

# Policy and control

# 7. Policy of the academic discipline (educational component)

At the time of each lesson, both lecture and practical, the student must have the Google meet application installed on the device from which he or she is working (in the case of distance learning), and the course "Technical regulation, standardization and certification in the energy sector" on the Sikorsky platform (the access code to the course is provided at the first lesson according to the schedule). Syllabus; lecture material; assignments for each practical lesson; variants of the module test; guidelines for practical work and calculation and graphic work; variants of the final test are available on the Sikorsky platform and in the KPI Electronic Campus system.

While taking the course "Technical regulation, standardization and certification in the energy sector", 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 "Igor Sikorsky Kyiv Polytechnic Institute"

The deadlines for each assignment are specified in the course "Technical regulation, standardization and certification in the energy sector" on the Sikorsky platform.

All students, without exception, are obliged to comply with the requirements of the Regulations on the system of prevention of academic plagiarism at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".

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 6 points (a professional publication of Ukraine). For publishing abstracts at a scientific conference, 3 points are awarded. The total amount of incentive points cannot exceed 10 points.

# 8. Types of control and rating system for assessing learning outcomes (RSA)

**Current control:** assignments within the framework of practical classes (9 practical classes × 4 points = 36 points), calculation and graphic work, 14 points, MCW (conducted directly at the practical class, in the presence of the teacher, 10 points). At the end of the lesson, the test is closed and cannot be rewritten or completed at home. The test contains thirty questions and several answers to each of them, one of which is correct. Each correct answer is worth 0.5 points.

The tasks within the practical and laboratory classes are evaluated in 5 points according to the following criteria:

* "excellent" - a complete answer (at least 90% of the required information), appropriate justifications and personal opinion are provided - 4 points;
* "good" - a sufficiently complete answer (at least 75% of the required information), which is performed in accordance with the requirements for the "skills" level or contains minor inaccuracies – 3 points;
* "satisfactory" - an incomplete answer (at least 60% of the required information), performed in accordance with the requirements for the "stereotypical" level and containing some errors – 2 points;
* "unsatisfactory" - unsatisfactory answer - 0-1 points.

**Calendar control:** is conducted twice a semester as a monitoring of the current state of fulfillment of the requirements of the sila-bus. 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.

**Semester control:** credit.Conditions for admission to the semester control: completed and credited practical works and MCW. Students who have fulfilled all the conditions for admission to the test and have a rating score of 60 or more points receive a grade corresponding to the rating without additional tests. The sum of the rating points received by the student during the semester is transferred to the final grade according to the table. If the sum of points is less than 60, but practical works and ICR are completed and credited, the student performs a test work. In this case, the sum of points for practical, ICR and test work is transferred to the final grade according to the table. A student who has received more than 60 points in a semester but wishes to improve his or her result may take part in the test work. In this case, the final result consists of the points obtained in the test work and the points for practical and internship work.

The test is worth 40 points. The test task of this paper consists of three theoretical questions from the list provided in the appendix to the syllabus.

Each question and task is worth 13 points (if you get 39 points for each question, 1 point is added to the grade) according to the following criteria

- "excellent" - a complete answer (at least 90% of the required information), appropriate justifications and personal opinion are provided - 13 - 11 points;

- "good" - a sufficiently complete answer (at least 75% of the required information), which is made in accordance with the requirements for the "skills" level or contains minor inaccuracies - 12 - 10 points;

- "satisfactory" - an incomplete answer (at least 60% of the required information), performed in accordance with the requirements for the "stereotypical" level and containing some errors - 9 - 7 points;

- "unsatisfactory" - unsatisfactory answer - 0 points.

Table of correspondence between rating points and grades on the university scale:

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| --- | --- |
| Number of points | Grade |
| 100-95 | Excellent |
| 94-85 | Very good |
| 84-75 | Good |
| 74-65 | Satisfactory |
| 64-60 | Sufficient |
| Below 60 | Non-satisfactory |
| The conditions for admission are not met | Not admitted |

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

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

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

**Work program of the discipline (Syllabus):**

**Developed by** associate professor, PhD, senior researcher, Anna V. Yakovlieva

**Approved by** the department of automaton of eletrotechnic and mechatronic complexes, minutes No 17 from 31.05.23р.

**Approved by** methodic council of the ES IESEM, minutes No 9 from 22.06.23 р.

1. The teacher's e-mail or other contacts for feedback, it is possible to specify office hours or hours for communication in case of contact numbers. For a syllabus of a discipline taught by many teachers (for example, history, philosophy, etc.), you can specify a page on the website where contact information for the teachers for the relevant groups, faculties, institutes is provided. [↑](#footnote-ref-2)