

Ministry of Education and Science of Ukraine
National Aerospace University
“Kharkiv Aviation Institute”

Department of Space Technology and Non-Conventional Energy Sources
(No. 402)

" APPROVED "

Guarantor EP

 Andriy POGUDIN

«29»__ 08__ 2025

**SYLLABUS OF THE MANDATORY COURSE
ACADEMIC DISCIPLINE**

Fundamentals of Energy Management

Area of knowledge: 14 "Electrical Engineering"

Specialty: 141 "Electrical Power Engineering, Electrical Engineering and Electromechanics"

Educational programs: "Non- Conventional and Renewable Energy Sources "

Level of higher education: first (bachelor's)

The syllabus is effective from 01.09.2025

Developer:

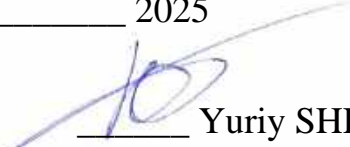
Assistant Professor of the Department
of Space Technology and
Non-Conventional Energy Sources (No. 402)


_____ Tetyana ZHUKOVA-BOYKO

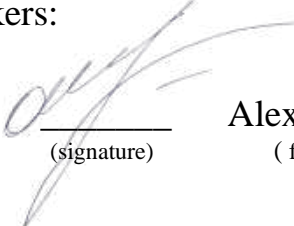
The syllabus of the academic discipline was considered at the meeting of the
Department of Space Technology and Non-Conventional Energy Sources

Protocol No. __1__ dated "28" __August__ 2025

Acting Head of the Department, Ph.D.,
Associate Professor


_____ Yuriy SHEPETOV


Agreed with the representative of education seekers:



(signature)

Alexander LISIN
(first and last name)

1. General information about the teacher

	Full name: Zhukova-Boyko Tetyana Nikolaevna
	Position: Assistant Professor, Department of Space Technology and Non-Conventional Energy Sources
	Academic degree: -
	Academic title: -
	List of disciplines taught: -Biothermochemical power plants; -Energy audit; -Thermal measurements and instruments; -Fundamentals of energy management
Areas of scientific research: -Development and improvement of energy-efficient and environmentally friendly technologies energy production, storage, measurement and management; - aircraft engines and power plants	
Contact information: t.zhukovaboyko@khai.edu	

2. Description of the academic discipline

Form of education	Full-time
Semester	8th
Language of instruction	Ukrainian
Type of discipline	Compulsory
Course volume: ECTS credits/number of hours	Full-time: 3 ECTS credits / 90 hours (36 classroom hours, including: lectures – 24, practical classes – 12; independent work – 54)
Types of educational activities	Lectures, practical (seminar) classes, independent work,
Types of control	Continuous assessment, module-based assessment, semester-end assessment – exam
Prerequisites	-Thermal measurements and instruments
Co-requisites	- Bachelor's final thesis
Post-requisites	-

3. Purpose and objectives of the academic discipline, lists of competencies and expected learning outcomes

The purpose of the academic discipline is: formation of knowledge on the theoretical foundations of management in the field of rational use of energy resources, existing models of energy management systems, methodological foundations of the formation and implementation of activities for the rational use of energy resources.

The objectives are:

gaining knowledge of the theoretical foundations of managing the rational use of energy resources, methodological foundations of forming and implementing activities for the rational use of energy resources, gaining skills in performing an energy inspection of an enterprise, auditing an energy management system, and developing a feasibility study for the need to implement an energy management system.

Competencies acquired:

Integral competence : The ability to solve specialized tasks and solve practical problems during professional activities in the field of electrical power engineering, electrical engineering and electromechanics or in the process of learning, which involves the application of theories and methods of physics and engineering sciences, is characterized by the complexity and uncertainty of conditions.

General Competencies (GC)

After completing this program, the student will be able to:

Ability for abstract thinking, analysis and synthesis.

Ability to apply knowledge in practical situations.

Ability to make decisions and act in accordance with the principle of non-acceptance of corruption and any other manifestations of dishonesty.

Special competencies:

After completing this program, the student will be able to:

Awareness of the need to increase the efficiency of electrical power, electrical engineering and electromechanical equipment of non-traditional and renewable energy facilities.

Program learning outcomes:

Be able to assess the energy efficiency and reliability of electrical, electrical and electromechanical systems of renewable energy

Apply appropriate empirical and theoretical methods to reduce losses of electrical energy during its production, transportation, distribution and use.

4. Course content

Content module 1

TOPIC 1. Introduction to the academic discipline. Basic concepts. Subject of study and objectives of the discipline. Determination of priority areas of energy conservation. Obstacles to the efficient use of energy. Strategy for solving energy conservation problems.

TOPIC 2. Energy management system at the enterprise. General principles of energy management organization. Energy manager and his tasks.

TOPIC 3. Energy management of the enterprise. Energy balance of the enterprise. Calculation analysis of energy balances.

TOPIC 4. Rationing of fuel and energy resources (FER) costs. Classification of FER cost rates. Calculation of FER cost rates.

TOPIC 5. Cost of energy products. Methods of calculating the cost of energy. Features of cost formation at thermal power plants, nuclear power plants and in transport energy systems. Ways to reduce the cost of energy products.

TOPIC 6. Pricing in the energy sector. Basic principles of market price formation. Price formation for fuel and energy resources. Electricity tariffs. Profit and profitability in the energy sector.

Content module 2

TOPIC 7. Planning of capital investments for the development of energy saving. Types of investment projects. General sequence of project development and analysis.

TOPIC 8. Investment needs of the project and sources of their financing. General scheme of investment analysis. Structure and characteristics of necessary investments.

TOPIC 9. Main criteria for the effectiveness of an investment project. Calculation schemes for assessing the effectiveness of investment projects.

TOPIC 10. Sources of investment financing. Sources of investment resources available to Ukrainian enterprises.

TOPIC 11. Fundamentals of the functioning of the energy market. The concept of the energy market and its participants. Experience in building and functioning of energy markets in Western Europe.

TOPIC 12. The system of state regulation of energy in Ukraine. Methods of state regulation. Legislative framework on the organization of energy saving.

TOPIC 13. Stimulation of energy conservation. Responsibility for violations in the field of energy conservation.

TOPIC 14. Environmental aspects of energy conservation. The relationship between ecology, economics and energy conservation. Fees for the use of natural resources. Payments (fees) for violations of the natural environment.

Topics for independent work

1. Basic concepts. Determination of priority areas of energy conservation. Obstacles to efficient use of energy. Strategy for solving energy conservation problems.
2. Energy management system at the enterprise. General principles of energy management organization. Energy manager and his tasks.
3. Energy management of the enterprise. Energy balance of the enterprise. Calculation analysis of energy balances.
4. Fuel and energy resource (FER) consumption rationing. Classification of FER consumption ratios. Calculation of FER consumption ratios.
5. Cost of energy products. Methods of calculating the cost of energy. Features of cost formation at thermal power plants, nuclear power plants and in transport energy systems. Ways to reduce the cost of energy products.
6. Pricing in the energy sector. Basic principles of market price formation. Pricing for fuel and energy resources. Electricity tariffs. Profit and profitability in the energy sector.
7. Planning of capital investments for the development of energy saving. Types of investment projects. General sequence of project development and analysis.
8. Investment needs of the project and sources of their financing. General scheme of investment analysis. Structure and characteristics of necessary investments.
9. Sources of investment financing. Sources of investment resources available to Ukrainian enterprises.
10. Main criteria for the effectiveness of an investment project. Calculation schemes for assessing the effectiveness of investment projects.
11. Fundamentals of the functioning of the energy market. The concept of the energy market and its participants. Experience in building and functioning of energy markets in Western Europe.
12. The system of state regulation of energy in Ukraine. Methods of state regulation. Legislative framework on the organization of energy saving.
13. Stimulation of energy conservation. Responsibility for violations in the field of energy conservation.
14. Environmental aspects of energy conservation. The relationship between ecology, economics and energy conservation. Fees for the use of natural resources. Payments (fees) for environmental violations.

5. Individual assignments

Not provided

6. Teaching methods

Conducting classroom lectures, practical work, individual consultations (if necessary), independent work of students based on materials published by the department (methodological manuals).

7. Assessment methods

Assessment of students' knowledge is carried out based on the results of current control, module control (exam).

8. Assessment criteria and distribution of points received by students

Table 8.1 – Distribution of points received by students

Components of educational work	Points for one lesson (task)	Number of lessons (tasks)	Total points
Content module 1			
Completion and defense of practical work	1...3	6	6...18
Modular control	15...30	1	15...30
Content module 2			
Completion and defense of practical work	1...3	6	6...18
Modular control	15...30	1	15...30
Total per semester			60...100

Semester control (exam) is conducted in case the student refuses the points of the current testing and if there is admission to the exam. When taking the semester exam, the student has the opportunity to get a maximum of 100 points.

The exam ticket consists of two theoretical questions. The maximum number of points for each theoretical question is 50 points.

Criteria for evaluating a student's work during the semester

Required amount of knowledge to receive a positive assessment:

Must know:

- terminology in the field of energy management;
- theoretical foundations of management in the field of rational use of energy resources;
- methodological foundations of the formation and implementation of activities for the rational use of energy resources;
- functions, content and key aspects of energy management activities;
- time levels and key aspects of energy management activities;
- essence, goals, and objectives of energy management.

The required amount of skills to receive a positive assessment:

- choose ways to overcome obstacles to the implementation of energy conservation policies;
- choose and apply a strategy to overcome barriers to energy efficiency and energy conservation;
- implement an energy management system at the enterprise.

Satisfactory (60-74). Have a minimum of knowledge and skills. Complete and defend all practical work. Demonstrate understanding of the basic principles of calculation methods.

Good (75 - 89). Acquire a minimum of knowledge and skills, complete all tasks, defend all practical work and RR within the time specified by the teacher with justification of the decisions made. Demonstrate understanding of most of the provisions of the calculation methodology.

Excellent (90 - 100). Fully know the main and additional material. Know all topics. Be familiar with textbooks and manuals. Complete all tasks, defend all practical work within the time specified by the teacher with justification of the decisions made. Demonstrate a high-quality understanding of all provisions of the calculation methodology.

Grading scale: point and traditional

Total points	Traditional scale rating	
	Exam, differentiated test	Test
90 – 100	Excellent	Pass
75 – 89	Good	
60 – 74	Satisfactorily	
0 – 59	Unsatisfactorily	Not counted

9. Course Policy

Attendance at classes. Regulation of absences. The interactive nature of the course requires mandatory attendance at practical classes. Students who, under certain circumstances, cannot attend practical classes regularly must agree with the teacher during the week on a schedule for individual work-through of missed classes. Individual missed classes must be worked out at the nearest consultation within a week after their absence. Work-through of classes is carried out orally in the form of an interview on questions specified in the class plan. In some cases, written work-through of missed classes is allowed by completing an individual written assignment.

Compliance with the requirements of academic integrity by education seekers during the study of the academic discipline. During the study of the academic discipline, education seekers must adhere to generally accepted moral and ethical norms and rules of conduct, the requirements of academic integrity stipulated by the

Regulations on Academic Integrity of the National Aerospace University "Kharkiv Aviation Institute" (<https://khai.edu/assets/files/plozhennya/plozhennya-pro-akademichnu-dobrochesnist.pdf>). It is expected that the works of education seekers will be their original research or reasoning. The absence of references to the sources used, fabrication of sources, plagiarism, interference in the work of other education seekers are, but are not limited to, examples of possible academic dishonesty . Identification of signs of academic dishonesty in the written work of an education seeker is grounds for its non-registration by the teacher, regardless of the extent of plagiarism or deception.

Conflict resolution. The order and procedures for resolving conflicts related to corrupt actions, conflicts of interest, various forms of discrimination, sexual harassment, interpersonal relationships and other situations that may arise during training, as well as the rules of ethical behavior are regulated by the Code of Ethical Behavior at the National Aerospace University "Kharkiv Aviation Institute" (<https://khai.edu/ua/university/normativna-baza/ustanovchi-dokumenti/kodeks-etichnoi-povedinki/>).

10. Methodological support

1. Gubin, S. V. Management and marketing of the space industry. [Text]: textbook / S. V. Gubin, T. Yu. Ivanova, T. Yu. Pavlenko. – Kh.: National Aerospace University named after M. Ye. Zhukovsky “Kharkiv Aviation Institute”, 2014. P. I. – 131 p.
2. Gubin, S. V. Management and marketing of the space industry [Text]: a textbook / S. V. Gubin, T. Yu. Ivanova, T. Yu. Pavlenko. – Kh.: National Aerospace University named after M. E. Zhukovsky “Kharkiv Aviation Institute”, 2016. – Part II: Marketing in space activities. – 90 p.

1 1. Recommended reading

Basic

1. Introduction to energy management: textbook/ A.V. Prakhovnyk, E.M. Inshekov , E.A. Shtogrin . — Kyiv: NTUU "KPI", 2010. – 272 p.
2. Energy management / Y.V. Dzyadykevich, M.V. Buryak, R.I. Rozum – Ternopil: Economic Thought, 2010. – 295 p.
3. Energy management. Manual for students of energy management courses / A.A. Malinovsky. Lviv. National University "Lviv Polytechnic", 2001. – 100 p.
4. Bakalin Yu. I. Energy conservation and energy management. – Kharkiv: Burun and K, 2006. – 320 p.
5. Energy management and audit. Part 1: Textbook / [M.G. Khmelnyuk, O.Yu. Yakovleva, O.V. Ostapenko] Under the general editorship of M.G. Khmelnyuk. – Kherson: FOP Grin D.S. 2017. – 224 p.
6. Guidance on the implementation of an energy management system in accordance with the requirements of the international standard ISO 50001:2018 / A. Chernyavsky, E. Inshekov , K. Yashyna, O. Borychenko, O. Solovey, P. Pertko / Edited by E. Inshekov and A. Chernyavsky. UNIDO, 2021.

Supplementary

1. Energy management systems and their mathematical support: a textbook / G. G. Pivnyak, S. I. Vypanasenko, O. I. Khovanska and others. – D.: National Mining University, 2013. – 214 p.
2. Fundamentals of energy management: lecture notes / S. V. Sapozhnikov. – Sumy: Sumy State University, 2015. – 163 p.

12. Information resources

1. State Agency for Energy Efficiency and Energy Saving of Ukraine [Electronic resource] – Access mode <http://saee.gov.ua/uk/regulations>
2. Law of Ukraine On Energy Saving No. 74/94-VR dated 01.07.1994 Contents [Electronic resource] – Regime access https://kodeksy.com.ua/pro_energozberezhennya.htm
3. Course Mentor page - <https://mentor.khai.edu/course/view.php?id=1445>