

Name of subject	Energy management (ECTS 10)
Subject/module code	EMEN14510
Science taught semester (s).	3 th and 4 th semester
Responsible teacher	Olimov Orif Nosirovich katta o'qituvchi.
Education language	Uzbek
Study to the program connection	Mandatory
Training hours (this including independent education)	Total hours - 300 . Audience Training hours - 120. Lecture training hour - 60 Laboratory training hour - 30 Practical training hour - 30 Independent education - 180 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject The purpose of the course is to teach students the parameters and conditions of Energy Management, to master the methods of calculating and analyzing the conditions of electrical networks and systems, to teach the basics of designing electrical systems, to teach measures to increase the efficiency of electrical networks, and to acquaint them with the main parts of electrical networks and mechanical electrical networks. their calculation. The task of the subject Students will build switching circuits of electrical network elements and determine their parameters, calculate the electrical states of open and closed electrical networks of varying complexity, study the characteristic operating states of electrical networks and systems and evaluate them, learn to control and adjust in electrical networks and systems; to teach the main criteria for designing electrical networks, improving and ensuring the efficiency of electrical networks. Learning outcomes: 1. The concept and structure of energy management 2. The importance of how to form an energy passport 3. General information on energy saving. 4. Types of energy waste in the power supply system and their connection. 5. Forecasting and standardization of electricity consumption. 6. Fundamentals of energy audit. 7. Energy monitoring. 8. Knowledge of the main legal and regulatory documents in the field and their use 9. Activities of energy services. 10. Energy management of investments in energy saving. 11. Measures to increase and popularize energy efficiency and marketing support. 12. Technical and economic energy efficiency of energy saving measures.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of science. Concept and structure of energy management. Energy management as a special type of management activity Topic 2: Energy resources of industrial enterprises: Types and classification. Topic 3: ISO-50001 international energy management standard. ISO-50001 - International standard. ISO-50001 software manual. Topic 4: General information on energy waste. Types of energy waste. Topic 5: General information on energy waste. Types of energy waste. Topic 6: Measures to reduce energy waste in the power supply system.. Topic 7: General information on regulating electricity consumption. General information on forecasting electricity consumption Topic 8 Types of regulating electricity consumption. Topic 9: Types of electricity consumption forecasting

Topic 10: Energy audit and structure. Energy balance and its types

Topic 11: Provision of energy audit services. Instrumental inspection

Topic 12: Energy monitoring of calculations.

Topic 13: Stages of energy monitoring. Stages of energy monitoring and verification of indicators..

Topic 14: Acceptance of energy services. Public-Private Partnership services.

Topic 15: Features of energy supply contracts with energy services.

Topic 16: Fundamentals of project management.

Topic 17: Management of changes in energy efficiency. Risks of starting energy efficiency.

Topic 18: Promotion of energy efficiency in industrial enterprises. Motivation of employees in the field of energy efficiency.

Topic 19: Information and marketing management of energy management.

Orientation of services in the field of energy efficiency and energy efficiency.

Topic 20: Efficiency indicators of energy saving projects.

Practice of evaluating energy saving projects.

Topic 21: Fundamentals of assessing the technical and economic efficiency of energy saving measures.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and competencies in various indicators of processes in electrical networks and systems, conducting experiments, calculating and drawing tables and graphs. The proposed topics are selected based on opportunities and conditions..

Recommended topics for laboratory work:

1. Study of the working process of devices for measuring the flux density of solar radiation;
2. Study of the structure and operation of the luxmeter RS 180-7133;
3. Study of the working process of a thermal imager;
4. The principle of operation of a motion sensor and analysis of types of motion sensors;
5. Schemes of motion sensors and their principle of operation, connection schemes;
6. Study of the working process of a small paraboloid-type solar concentrator;
7. Determination of the temperature at the focus of a small paraboloid-type solar concentrator with a diameter of 80 cm;
8. Study of the temperature regimes of a solar photovoltaic module;
9. Study of the working process of active solar water heaters;
- 10 Study of the working process of active solar water heaters;
11. Fundamentals of investment project management and management of project changes in energy efficiency.;
12. Study of information and marketing management of energy management and economic assessment of energy efficiency.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and competencies in calculating and drawing tables and graphs, conducting experiments, and analyzing various indicators of electrical energy management processes. The proposed topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

- 1 Calculation of energy indicators in the formation of energy management.
2. Calculation of electricity consumed by consumers at established prices.
3. Calculation of power and energy waste in the power supply system.

4. Calculation of standard indicators of electricity at industrial enterprises.

5. Calculation of forecast indicators of electricity consumed in the future.

6. Calculation of waste when conducting audits at industrial enterprises.

7 Calculation of energy indicators in the formation of energy passports of industrial enterprises and buildings.

8. Calculation of energy indicators in energy monitoring at industrial enterprises.

9. Formation of energy service at industrial enterprises

10. Calculation of electricity waste.

11. Calculation of energy savings through the use of non-traditional energy sources in the energy supply of consumers.

12. Definitions and prices in energy. Cal

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation of energy indicators in the formation of energy management.

2. Calculation of electricity consumed by consumers at established prices.

3. Calculation of power and energy waste in the power supply system.

4. Calculation of standard indicators of electricity at industrial enterprises.

5. Calculation of forecast indicators of electricity consumption in the future.

6. Calculation of waste when conducting audits at industrial enterprises.

7. Calculation of energy indicators in the formation of energy passports of industrial enterprises and buildings.

8. Calculation of energy indicators in energy monitoring at industrial enterprises.

9. Formation of energy service at industrial enterprises

10. Calculation of electricity waste.

11. Calculation of energy savings through the use of non-traditional energy sources in the energy supply of consumers.

12. Definitions and prices in energy. Calculation of the amount of payment for the forms of energy consumed.

13. Settlement with consumers for electricity according to a differentiated definition

14. Calculation of electricity waste in lines and transformers

15. Calculation of electricity waste at industrial enterprises
16. Calculation of energy savings at household consumers
17. Energy-economic indicators for the regulation of fuel and energy resources
18. Calculation of quantities characterizing electrical load graphs.
19. Calculation of the calculated load using the main and auxiliary methods.
20. Calculation and selection of the amount of compensated reactive power.
21. Project management. Project scope and objectives. Network analysis. Engineering support tools, operations and task planning.
22. Impact of environmental factors. Impact of external factors on the activities of engineering organizations, issues of ethics and corporate social responsibility.

IV. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

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1. Calculation of electricity waste.
 2. Calculation of energy savings through the use of non-traditional energy sources in the energy supply of consumers.
 3. Definitions and prices in energy. Calculation of the amount of payment for the forms of energy consumed.
 4. Settlement with consumers for electricity according to a differentiated definition
 5. Calculation of electricity waste in lines and transformers
 6. Calculation of electricity waste at industrial enterprises
 7. Calculation of energy savings at household consumers
 8. Energy-economic indicators for the regulation of fuel and energy resources
 9. Calculation of quantities characterizing electrical load graphs.
 10. Calculation of the calculated load using basic and auxiliary methods.
 11. Calculation and selection of the amount of compensated reactive power.
 21. Project management. Project scope and objectives. Network analysis. Engineering support tools are planning operations and tasks.
 22. The influence of environmental factors. The influence of external factors on the activities of engineering organizations, issues of ethical and corporate social responsibility.
- Practical classes are held in an auditorium equipped with multimedia devices by one professor per academic group. Classes are conducted using active and interactive methods and, accordingly, it is desirable to arouse students' interest in the possibilities of deepening knowledge through the use of appropriate pedagogical and information technologies, to provide the opportunity to independently obtain results, and to prepare them theoretically and methodologically.
- 2.4. Instructions and recommendations for laboratory work

The following topics are recommended for laboratory work:

1. Study of the working process of devices for measuring the flux density of solar radiation;
2. Study of the structure and operation of the luxmeter RS 180-7133;
3. Study of the working process of a thermal imager;
4. The principle of operation of the motion sensor and analysis of the types of motion sensors;
5. Schemes of motion sensors and their principle of operation, connection schemes;
6. Study of the operation of a small paraboloid-type solar concentrator;
7. Determination of the temperature at the focus of a small paraboloid-type solar concentrator with a diameter of 80 cm;
8. Study of the temperature regimes of the solar photovoltaic module;
9. Types of energy-saving and sound-insulating materials;
10. Study of the operation of active solar water heaters;
11. Fundamentals of investment project management and management of project changes in energy efficiency.
12. Information and marketing management of energy management and economic assessment of energy efficiency.
13. Assessment of the economic efficiency of investments in energy saving measures.
14. Calculation of energy consumption when conducting an energy audit.
15. Study of graphs of electrical loads of industrial enterprises.

In the process of laboratory work, students develop skills in studying automated energy accounting and control systems in the power supply system, studying the principle of operation of single- and three-phase meters, testing energy testing devices, and studying methods for automatic adjustment of reactive power.

Laboratory work should be conducted by one teacher in a laboratory auditorium equipped with devices representing the topic, with the number of students per academic group being up to 15.

2.5. Instructions and recommendations for course work (project)
Course work (project) is not included in the curriculum.

2.6. Independent study and independent work
Recommended topics for independent study:

1. The role of energy in Uzbekistan;
2. The history of the development of electric power in Uzbekistan;
3. The role and current state of energy management in Uzbekistan;
4. Requirements for international energy management standards;
5. Energy resources and their types;
6. Definitions and prices set for electricity in foreign countries;
7. Experience of foreign countries in energy conservation;
8. Waste in the power supply system;
9. Norm and its types;
10. Forecasting and its types;
11. Experience of foreign countries in regulating electricity;
12. Stages of conducting an energy audit at industrial enterprises;
13. Formation of an energy balance at industrial enterprises;
14. Energy audit and its types;
15. Energy passport of energy installations;
16. Energy passport of industrial enterprises;
17. Energy monitoring and its types;
18. Conducting energy monitoring at industrial enterprises;
19. Formation of energy services at industrial enterprises;

	20. Energy indicators at industrial enterprises and their calculation; 21. State of energy services of foreign countries; 22. Investment and its types; 23. Formation of investment projects; 24. Energy efficiency 25. The concept of energy efficiency; 26. Information management of energy management; 27. Marketing management of energy management; 28. Methods of energy efficiency management; 29. Evaluation of energy efficiency projects; 30. Performance indicators of energy efficiency projects.
Student assessment	Assessment of student knowledge is carried out on the basis of mastering the educational material during the semester and the results of the final control (tests, assignments, written and oral work results). During the course of energy management, students are assessed on a 100-point system. Of these, 50 points are given to the current and intermediate results (60% of the 50 points are current control, independent learning and 40% are intermediate control), and 50 points are given to the results of the final control. Students whose total score of current and intermediate points is less than 30 points are not admitted to the final control exam. A student who scores 30 or more points in the final control is considered to have mastered the subject.
Requirements for exams	The student must have fully mastered the theoretical and practical concepts of the subject, be able to correctly reflect the results of the analysis. The student must have completed the tasks given in the current and intermediate forms of independent work, assessment. At the same time, he must have received the necessary points from the current, intermediate, independent education and final tests in the relevant subject within the specified time. A student who has not submitted current control, intermediate control and independent education tasks, as well as who has scored less than 30 points on these tasks and types of control, will not be included in the final type of control. Also, a student who has missed 25 or more percent of the classroom hours allocated to the subject without an excuse will be expelled from this subject, will not be allowed to take the final exam and will be considered as not having mastered the relevant credits in this subject. A student who fails the final exam or scores less than 30 points on this type of exam is considered academically indebted.
Recommended Literature	1. Main literature: 1. Kazuo Matsuda, YasukiKansha, ChihiroFushimo, Atsushi Tsutsumi, Akira Kishimoto. Advanced Energy Saving and its Applications in Industry. Japan – “Springer”, 2013. – 94 p. 2. Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari. O'quv qo'llanma. – T.: “Voriz”, 2014 – 192 bet. 3. Allaev K.R., Khoshimov F.A. Energy saving in industrial enterprises. Monograph. – T.:Fan. 2012. 1. 4. Blinov Y.I., Vasilev A.S., Nikanorov A.N. and others. Modern energy-saving electrical technologies. Study guide. Publishing house SPbGETU "LETI", 2001. - 564 p. . Additional literature: 5. Mirziyoyev Sh.M. Together we will build a free and prosperous, democratic Uzbek state. On the post of President of the Republic of Uzbekistan 6. On the Strategy of Actions for the Further Development of the Republic of Uzbekistan. - T.: February 7, 2017, Decree No. PF-4947. 7. Law of the Republic of Uzbekistan “On the Rational Use of

Energy”. April 25, 1997.

8. Law of the Republic of Uzbekistan “On Electric Power”. September 30, 2009.

9. Taslimov A.D., Rismukhamedov D.A., Rakhmonov I.U. Methodological guide for laboratory work on energy control and accounting in the power supply system. - T.: ToshDTU, 2014.

10. Saidkhodzhaev A.G., Saidkhodzhaeva M.A. Methodical guide for practical and independent work on the basics of energy saving. - T.: ToshDTU, 2015.

11. Energetic management. Uchebnoe posobie. Vladimir 2014.

12. Tereshkina T.R. Sistemy energomenedzhmenta. Standard ISO-50001.

Uchebnoe posobie. St. Petersburg-2013.

6.3. Information sources:

www.gov.uz – Government portal of the Republic of Uzbekistan.

www.catback.ru – International scientific articles and educational materials

website. www.google.ru – International educational materials search website.

www.ziynet.uz – National educational materials search website.

www.lex.uz – National database of UzRes.Konun documents.

www.catback.ru – Scientific articles and educational materials.