Fan name	Introduction to the Specialty (ECTS 6)
Subject/module code	YK1106
Science taught semester (s).	1st semester
Responsible teacher	Akhmedov Abdurauf Abdug‘ani o‘g‘li, Senior teacher
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	**Total hours - 180.** **Auditory Training hours – 72.** Lecture training hours - 36 Laboratory training hour - 0 Practical training hours - 36 **Independent education -108 hour**
ECTS	6
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject** is to provide students with basic knowledge of the specific characteristics of the energy sector, basic concepts about the sector, the processes of generating and consuming electricity using electrical machines, and basic information about the sector. **The task of the subject** is to teach basic concepts about energy sources, the role of electrical machines and devices in the production, transmission, distribution and consumption of electrical energy, initial information on the design of power supply systems for electricity consumers, and the specific features of the use of traditional and non-traditional energy sources. **Learning outcomes:** 1. Must have knowledge of the structure and principle of operation of electrical machines. 2. Must have knowledge of the characteristics and design of electric motors and generators. 3. Must have knowledge of the structure and working principle of a transformer. 4. Must have knowledge of transformer specifications and design. 5. Knows and uses basic concepts and their essence in the field, basic information on the design of electrical machines and transformers, and the specific features of the use of traditional and non-traditional energy sources. 6. Can determine the characteristics of electrical machines and transformers based on calculations using Coulomb, Faraday, Ohm, Joule-Lens, and Kirchhoff laws. 7. Be able to study and analyze existing problems in the field of providing consumers with uninterrupted and high-quality electricity and adopt preliminary solutions to these problems. 8. Knows how to determine the electric current and voltage, electric power, power factor, losses, and useful efficiency of direct and alternating current electrical machines and transformers.
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions)** **Topic 1:** The role of the electric power industry in the development of society. The role of energy in Uzbekistan. Goals and objectives of science. Three aspects of energy. Energy science. **Topic 2:** Energy sector in Uzbekistan. General information about the direction of electric power. Development prospects of the electric power sector of Uzbekistan. **Topic 3:** Uzbek scientists who laid the foundation for the development of the fields of electrical engineering and electromechanics. **Topic 4:** Electrical energy sources. Sources and types of electrical energy. **Topic 5:** Types of power plants operating on different energy

	sources. Geothermal Power Plant, Power plants operating on the Earth's geothermal energy, Thermal Power Plants, Unconventional Power Plants. **Topic 6:** Consumption of energy resources. Processes of using energy resources. **Topic 7:** Structure of thermal power plants. The process of generating electrical energy in a thermal power plant. Thermal condensing power plants. **Topic 8:** Structure of nuclear power plants. Principle of operation of a nuclear power plant. Function of the reactor in a nuclear power plant. **Topic 9:** Renewable energy sources. Potential of renewable energy sources in Uzbekistan, state of their use and prospects. Traditional types of renewable energy sources. **Topic 10:** Structure of wind power plants. Wind energy is the science and technology of using the kinetic energy of wind flow to produce mechanical, electrical and thermal energy. **Topic 11:** Structure of solar power plants. Principle of operation of a solar power plant. Existing solar power plants in developed countries. **Topic 12:** Components of the electric power system. Energy system. Unified energy system of Uzbekistan. Electric networks and systems. Areas of application of electric energy in the national economy. **Topic 13:** Electrical machines and apparatus. Electrical apparatus are devices for changing, adjusting, and measuring electrical and non-electrical parameters of various devices, machines, mechanisms, etc. **Topic 14:** Types and applications of electrical machines. Transformers, asynchronous, synchronous and DC machines. **Topic 15:** General concepts of asynchronous electric machines. Asynchronous machines are characterized by their simplicity of construction, commissioning and maintenance, and high reliability. **Topic 16:** Synchronous machine structure. The main losses in a synchronous machine are electrical losses in the stator winding, excitation losses, magnetic losses, and mechanical losses. **Topic 17:** Structure and application of AC machines Fields. Structure and principle of operation of permanent current machines, calculation of magnetic circuits. **Topic 18:** Structure and applications of transformers. Functions and applications of transformers; requirements for them; concepts of magnetic systems and coils. **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 processes in electrical networks and systems. The proposed topics are selected based on opportunities and conditions. **Recommended topics for laboratory work:** Laboratory work is not included in the curriculum. **III. Practical training instructions and recommendations** The teacher's preparation for a practical session begins with studying the initial 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 session , the amount of work that each student must perform. Methodological guidelines are the teacher's main methodological document in preparing and conducting practical classes. The goal of practical training is to understand theory and acquire skills. Its conscious application in educational and professional activities consists in developing the ability to confidently formulate one's own point of view.

The following topics are recommended for practical training:

1. Study of areas of use of electrical energy .
2. Study of electrical energy and its main indicators
3. Learn to measure the work done by electric current
4. Studying the development prospects of the hardware industry
5. Study of cooling systems of turbogenerators and hydrogenerators in power plants.
6. Study of the operating modes of asynchronous electric machines.
7. Study the types of devices for dividing electrical energy, active, reactive and total power, and methods of connecting them.
8. Learn to connect and use instruments for measuring electrical voltage, current, and frequency in electrical networks and devices.
9. Use of single-phase, three-phase electrical circuits, "star" and "delta" connection schemes in electrical networks and devices
10. Standard designations of electrical circuits and devices and their application. and values of standard voltages and their areas of application.
11. Study of operating modes of asynchronous electric machines.
12. Study of starting schemes of synchronous motors
13. Methods of controlling AC motors.
14. Learn the use of grounding protection devices in electrical circuits and devices.
15. Study the structure of electrical devices
16. Study of devices for measuring the aging of electrical materials and their use.
17. Determining the parameters of a transformer circuit
18. Study of types of testing of electrical machines and transformers

IV. Independent study 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.

Recommended topics for independent study:

1. The role of energy in Uzbekistan;
2. History of the development of electric power in Uzbekistan;
3. Development prospects of the electric power sector of Uzbekistan;
4. The role of energy in technological progress;
5. Processes of using energy reserves;
6. Coal, oil, natural gas and nuclear energy reserves;
7. Wind and solar energy reserves;
8. Hydropower reserves;
9. Energy reserves and other energy reserves generated from the rise and fall of sea water;
10. Principle of operation of thermal power plants, thermal power plants, hydroelectric power plants, solar power plants, wind power plants, nuclear power plants;
11. Understanding of existing hydroelectric power plants and thermal power plants in Uzbekistan;
12. Water storage power plant. The principle of operation of hydroelectric power plants;
13. The principle of operation of a magnetohydrodynamic generator;
14. Electric power industry;
15. Use of electrical energy in the national economy;
16. Energy system;
17. Electric motors and generators;
18. Energy and environment;
19. Coulomb's law;

	20. Faraday's law of electromagnetic induction; 21. Ohm's law for a part of an electrical circuit; 22. Ohm's law for the entire circuit; 23. Electric current and voltage in DC circuits; 24. Kirchhoff's first law; 25. Kirchhoff's second law; 26. The process of generation, transmission, distribution and consumption of electrical energy; 27. Electrical resistances and their parallel and series connections; 28. Become familiar with current, electric power, and efficiency; 29. Alternating current electrical circuits; 30. Transformers and their principle of operation.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean’s office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean’s office. After completion of the final work, the work is immediately encrypted by a representative of the Dean’s office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.

Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge

5 grade	100 points		Assessment criteria
5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.

	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.

Course assessment criteria and procedure

Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
		Student activity (in seminars, practical, laboratory classes)	10 points	
Midterm assessment	20 points	Supervision: Written work	10 points	12 points
		System tasks	10 points (divided by the number of tasks)	
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points

* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.

Recommended Literature

Main literature:

1.Аллаев К.Р., «Электроэнергетика Узбекистана и мира», -Т.: «Фан ва технология», 2009.- 385 с.

2.Toirov O.Z., Pirmatov N.B., Yusupov D.T., Taniyev M.X. Elektr mashinalarini ekspluatatsiyasi. Darslik. T: TDTU, 2023. 211 b.

3.Imomnazarov A.T. Yo‘nalishga kirish. Toshkent: ToshDTU. 2013.

4.Цыпкина В.В., Пулатов А.О., Иванова В.П., Турабеков А.У. Введение в специальность. Учебное пособие. Т.: ТГТУ, 2022. 253 с.

5.Ҳошимов О.О., Имомназаров А.Т. Электр юритма асослари. 1-қисм. Олий ўқув юртлари учун ўқув қўлланма. Т.: ТДТУ, 2004.

6.Mustafakulova G.N, Bekishev A.Y., Taniyev M.X. Elektr mashinalari va transformatorlarni ta'mirlash va sinash. Darslik. T.: TDTU, 2019. 211 b.

7.Алимходжаев К.Т, Зиёхўжаев Т.И, Пирматов Н.Б., Мустафакулова Г.Н. Электр машиналарини ишлатиш ва таъмирлаш. Т.: ТошДТУ, 2017. 250 б.

8.Berdiyev U.T., Pirmatov N.B., Hasanov F.F., Berdiyorov O‘.N., Elektromexanika. Darslik. T.: TDTU, 2023. 394 b.

9.Ҳошимов О.О., Имомназаров А.Т., Электромеханик қурилмалар ва мажмуаларнинг элементлари. Олий ўқув юртлари учун дарслик. Т.: «ЎАЖБНТ» Маркази, 2003.

Additional literature:

10.Mirziyoyev Sh.M. Yangi O‘zbekiston taraqqiyot strategiyasi. 2-to‘ldirilgan nashr. – T.: O‘zbekiston, 2022. – 44 b.

11.Islom Karimov nomidagi Toshkent davlat texnika universiteti talabalari mustaqil ta’limni tashkil etish bo‘yicha Tartibi. – T.: ToshDTU, 10.06.2024. – 6 b.
12.Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari, O‘quv qo‘llanma, -T.: «Voris-nashriyot», 2014.
13.Karimov X.G., Rasulov A.N., Taslimov A.D. Elektr tarmoqlari va tizimlari, O‘quv qo‘llanma, -T.: “Tafakkur qanoti” nashriyoti, 2015.

Internet resources:

14.www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.
15. www.ziyonet.uz – national educational materials search site.
16. www.gov.uz – Government portal of the Republic of Uzbekistan.
17.www.google.com – international educational materials search site.
18.www.energystrategy.ru – “Energy Policy and Strategy” information portal
19.www.twirpx.com – international educational materials search site.