Name of subject	Electrical and Electronic Devices (ECTS 6)
Subject/module code	EEA1306
Science teachable semesters	3rd semester
Attached teacher	Kushakov Gulmurod Adilovich, Senior teacher
Education language	Uzbek
Connection to the curriculum	Compulsory
Study hours (including independent learning)	**Total 180 hours .** **Auditory training hours - 72** Lecture hours - 48 Laboratory study hour - 12 Practical study hour – 12 **Independent education -108 hour**
ECTS	6
and objectives of science / learning outcomes	**The goal of teaching science is to** provide students with an understanding of electrical and electronic devices, basic concepts in the field, basic concepts and definitions of electrical and electronic devices, understanding the theoretical and practical skills of electrical and electronic devices, and the ability to apply the acquired knowledge in practice, as well as the skills to solve various problems and issues related to the field. **The task of the subject is** to show students the history and prospects of development of electrical and electronic devices, the basics of electrical operation, the functions of electric machines, their place in enterprises of various sectors of the national economy, to form and develop the thinking of exploitation in industrial enterprises, to teach them to clearly state their opinions and conclusions in a well-founded manner, and to develop the skills to apply them in practice. **Learning outcomes:** 1. Studies the regulatory documents of the higher education system and the organization of the educational process in the credit-module system. 2. Studies higher education technologies and interactive teaching methods. 3. Learns the theoretical concepts of electrical and electronic devices. 4. Acquire practical skills to adapt to studying in the credit-module system in higher education. 5. Master the knowledge of statistics on the development of the industry in the world and in our country. 6. Can analyze the role of electrical and electronic devices in production processes. 7. Be able to classify and analyze the components of electrical and electronic device systems. 8. They will have the opportunity to study and analyze the basic processes of electrical and electronic devices.
Course content (topics)	**I. Home theoretical part (Lecture)** **Topic 1:** Classification of electrical appliances. Basic concepts and descriptions. **Topic 2:** Protection of electrical equipment. The influence of mechanical and climatic factors on electrical equipment. **Topic 3:** Direct current electromagnets.. **Topic 4:** Classification of direct and alternating current magnetic circuits. **Topic 5:** Magnetic circuits of devices. **Topic 6:** Magnetic circuit of direct and alternating current electromagnets. **Topic 7:** Electromagnetic coils. **Topic 8:** Energy balance of an alternating current electromagnet. **Topic 9:** The attractive force of constant and alternating current

electromagnets.

Topic 10: Dynamics and start-up time of an electromagnet.

Topic 11: Permanent magnet magnetic circuits.

Topic 12: Electrodynamic amplifiers in hardware elements.

Topic 13: Thermal stability of electrical devices.

Topic 14: Calculating temperature rise in electrical devices.

Topic 15: Electrical contacts, concepts and theories.

The concept of current density. Advantages and disadvantages of the method.

II. Guidelines and recommendations for organizing laboratory exercises.

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

Suggested topics for laboratory work:

1. Magnetic starters.
2. Study the dependence of transient resistance on contact pressure and contact material.
3. Study the mechanical characteristics of electrical devices.
4. Study the characteristics of the attraction of a DC electromagnet.
5. Study of the magnetic starter (launcher).
6. Study of electromagnetic current relay. Study of electromagnetic time relay.

III. Practical for 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, as well as 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.

Recommended practical topics :

1. Classification of electrical appliances. Basic concepts and descriptions.
2. Protection of electrical equipment. The influence of mechanical and climatic factors on electrical equipment
3. Electric arc. Energy balance of the arc.
4. Constant and alternating current arc.
5. Arc extinguishing methods.
6. Electrodynamic strength of electrical devices. Methods for calculating electrodynamic forces (EDK).

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. Areas of application, classifications of electromagnets, calculation of magnetic fields.

	2. Calculate and experimentally determine the magnetic permeability of air gaps. 3. Calculation of the magnetic field of a constant current electromagnet based on the values of the windings. Magnetic circuits of alternating current electromagnets. Calculation of windings. 4. Energy balance of a constant current electromagnet. 5. Maxwell's formula, calculation of gravitational force. Gravitational force of alternating current electromagnets. Magnetic damper. 6. Traction and mechanical characteristics of alternating and direct current electromagnets. Electromagnetic dynamics, displacement and time of movement. Use in acceleration and deceleration. 7. Electrodynamic amplifier (EDU), calculation methods. 8. Electrodynamic stability. Heating of electrical devices, heating standards, thermal stability. 9. Electrical contacts, concepts and theory. Structure and selection of switching contacts. 10. Electric arc, physical phenomena, basics of arc ignition and extinguishing in direct current.
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. Казоков В.А. Электрические аппараты.-М.: ИР РадиоСофт, 2009
2. Чунихин А.А. Электрические аппараты.-М.: Энергоатомиздат. 1988
3. Жукова, Г. А., Золина М.А. Лабораторные работы по электрические аппараты.-М.:Высшая школа, 1986.
4. Majidov S. Elektr mashinalari va elektr yuritma.-T.: O`ituvchi, 2002.-358 b.
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ta’minlash –yurt taraqqiyoti va xalq farovonligining garovi. O`zbekiston Respublikasi Konstitutsiyasi qabul qilinganining 24 yilligiga bag`ishlangan tantanali marosimdagi ma’ruza 2016 yil 7 dekabr.-T.: “O`zbekiston” NMIU, 2016.-48 b.

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11. J. Stephen, Chapman, Electric Machinery Fundamentals, 2011, Paperback, New.

12. Кацман М.М. Сборник задач по электрическим машинам. Учеб. Пособие для вузов.- Москва.:-Издательский центр “Академия”.2012.-154 с.

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16. http://rbip.bookchamber.ru/description.aspxproduct_no=854;

17. http://energy-mgn.nm.ru/progr36.htm