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
Science type	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.
Student assessment	Assessment of student knowledge is based on the mastery of teaching materials (tests, assignments, written and oral work results) during the semester and final examination. During the Electrical and Electronic Devices course, students are assessed on a 100-point scale. Of these, 50 points are allocated to the current and intermediate results (60% of the 50 points are current control, independent study and 40% intermediate control), and 50 points are allocated to the final control result. Students whose total current and intermediate scores are 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.
Exam requirements	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	**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. 5. Alimxodjayev K.T, Pirmatov N.B., Ziyoxodjayev T.I., Mustafakulova G.N. Elektr mashinalari va transformatorlarning ekspluatatsiyasi.-T.: “Fan va texnalogiya”, 2019. -240 b. **Additional literature:** 6. Mirziyoyev Sh.M. Erkin va farovon, demokratik O`zbekiston

davlatini birgalikda barpo etamiz. O`zbekiston Respublikasi Prezidentining lavozimiga kirishish tantanali marosimiga bag`ishlangan Oliy Majlis palatalarining qo`shma majlisidagi nutqi.-T.: “O`zbekiston” NMIU, 2016. -56 b.

7. Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini 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.

8. Mirziyoyev Sh. M. Buyuk kelajagimizni mard va oliyjanob xalqimiz bilan birga quramiz.-T.: “O`zbekiston” NMIU, 2017.-488 b.

9. O`zbekiston Respublikasini yanada rivojlantirish bo`yicha Harakatlar strategiyasi to`g`risida. –T.:2017 yil 7 fevral,PF-4947-sonl Farmoni.

10. Electric Machines: Theory, Operating Applications, and Controls.2001, Prentice Hall.

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.

13. Pirmatov N.B., Zayniyeva O. E. Elektromexanika (Elektr mashinalari) fanidan masalalar to`plami. O`quv qo`llanma .-T.:TDTU, 2004.-75 b.

Internet sources:

14. www.Ziyo.net

15. http://dhes.ime.mrsu.ru/studies/tot/tot_lit.htm;

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

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