Name of subject	Energy-efficient automated electrical drives **(ECTS 4)**
Subject/module code	AEYU2405
Science taught semester (s).	4 semesters
Responsible teacher	Kushakov Gulmurod Adilovich , senior teacher.
Education language	Uzbek
Study to the program connection	Elective
Training hours (this including independent education)	**Total hours - 120** **Auditory training hours - 48** Lecture session hours - 24 Practical study hours - 24 **Independent education -72 hour**
ECTS	4
The purpose and tasks of subject / learning outcomes	**The goal of teaching the subject** is to develop in students the skills to analyze the structure of electromechanical systems, their elements, basic characteristics, and functions of electrical drives, the type of electromechanical system based on the requirements placed on them, its structural structure, and the shortcomings and operating principles of existing systems. **The task of science is** to provide students with theoretical knowledge, It consists in the formation of practical skills, a methodological approach to the physical processes occurring in high-voltage circuits, and a scientific worldview . It consists in the formation and development of operational thinking in industrial enterprises, training in the ability to clearly state one's opinions and conclusions in a well-founded manner, and the formation of the ability 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. Study of technological higher education and interactive teaching methods 3. socio-economic reforms in our republic, regional problems, and achievements in science, technology, and engineering in the field of automation for industrial development; 4. working to release in automation main tasks ; 5. ***about*** the main stages of development of automation equipment and current trends ***to the imagination has to*** be ***;*** 6. automation in the field technician of tools structure principles and work principles ; 7. public automation technician of tools static , dynamic and reliability descriptions calculation methods ; 8. automation technician medium demand done classifications to form ; 9. technological of processes automation level increase for technician of tools instead assessment methods knowledge ***and from them use to receive;*** 10. automation technician tools static , dynamic and reliability descriptions to determine ; 11. demand done control , adjustment , management algorithms done increase can technician tools choice skills has to be ; 12. non-public automation systems tools for technician assignments to compile ;

	13. technician tools and their basis organization those who calculation and selection ; 14. When analyzing the operation of technical devices, their designers ***must have the skills to*** correctly determine their design parameters based on certain criteria. ***has to*** be ***necessary.***
Course content (topics)	**1. Home theoretical part (Lecture)** **Lecture 1:** " Automated electromechanical systems " Introduction . Fanning purpose and objectives. General concepts . **Lecture 2:** Automated electromechanical systems structure and main parts . **Lecture 3:** Elements of electromechanical systems . **Lecture 4:** Electromechanical couplings and their functions . **Lecture 5:** AC motors . **Lecture 6:** Immutable vine Engine torque and torque equations . **Lecture 7:** : Contactless (OTD) circuit and work principle **Lecture 8:** Asynchronous execution Connection diagrams and control methods of asynchronous execution engines . **Lecture 9:** Basic devices of automated electromechanical systems . Synchronous motors **Lecture 10:** C h linear motion engines **Lecture 11:** Electromechanical systems measurement Elements . Selenium . **Lecture 12:** Circulation transformers , their schemes , work principles . **Lecture 13:** Tachogenerators . **Lecture 14:** Open management schematic electricity Drives . Solid control schemes for electric drives . **Lecture 15:** Control scheme of an electric drive with a synchronous motor. **II. Practical for training instructions and recommendations** Practical multimedia devices for training with equipped in the auditorium every one academic to the group separately will be passed. Trainings active and interactive methods using " Keystage " technology used , cases content teacher by is marked . Demonstrative materials and information multimedia devices using is transmitted . In addition , the textbook and training manuals based on students knowledge to strengthen reach , distribution from materials use , scientific articles and publishing theses through students knowledge increase , issues solution , topics according to demonstrative weapons preparation and others recommendation is being done . **Recommended practical topics** : 1. Determining the requirements for automated electromechanical systems. 2. Calculation of load torque and force in electromechanical systems. 3. Calculation of load capacity. Actuator mechanism . Construction of load diagram. Motor selection. Calculation of the gear ratio of the reducer. Checking the selected motor. 4. Selection of information elements of electromechanical systems. 5. Position , speed and torque sensors. 6. Calculation of parameters of the electric drive adjustment system. 7. of the parameters of the structural scheme of a DC motor . Construction of a static electromechanical characteristic.

	8. Calculation of speed adjustment contour parameters. **III. 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. Application of AEMS in mechatronic modules. 2. Principal alarm schemes design . 3. Using micromotors in robots sectors . 4. Electricity in supply backup and him/her automatic to work unloading 5. Electricity the procedure static and dynamic modes study . 6. Three phased transformers 7. Microprocessor complex elements . 8. C h linear motion engines calculation 9. Direct current linear motion motors study . 10. Synchronous linear motion motors study . 11. Multi-coordinate motors, their use in robots. 12. Imitative procedures use sectors . 13. AEMS sensors study . 14. Cable and of wires the ends to level assembly to do 15. Electricity the procedure management and protection to do
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 of the course Energy-efficient automated electrical drives, students are evaluated on a 100-point system. 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 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	**Main literature:** 1. Yusupbekov NR, Mukhamedov BI, Gulyamov Sh.M. Control

and automation of technological processes. - Tashkent: O`qituv, 2011. -576p.
2. NK Yu'ldoshev, NR Kadirkhodjayeva “Production Technologies” Tashkent — 2014
3. John J. Criag Mechanics and Control - Pearson Education International, 2013
4. Klim Yu.M. Typical elements of the automatic control system. Uchebnoe posobie dlya studentov uchrejdeniy srednego professionalnogo obrazovaniya. -M: FORUM: INFRA-M, 2004.-384p.
5. Moskalenko V.V. System of automatic control of electric power»: - M. INFRA, 2001. Shishmarev V. Yu. TIPOV EAT elements of the automatic control system. Uchebiik dlya sred.prof.obrazovaniya. -M: Izat. "Academy", 2004 -304p.
6. Zimin B.N., Yakovlev V.A. "Avtomaticheskoe upravlenie elektroprivodami". M: vysh.shk.1989g.
7. Basharin A.V. i dr. "Upravlenie elektroprivodami" L: VYSSH.SHK 1982g.
8. Klyuev V.I. i dr. "Theory in electric power". - M: VYSSH.SHK 2002g.

Additional literature:

1. Mirziyoyev Sh.M. Together we will build a free and prosperous, democratic state of Uzbekistan. Speech at a joint session of the chambers of the Oliy Majlis dedicated to the solemn ceremony of taking office of the President of the Republic of Uzbekistan. – T.: “Uzbekistan” NMIU. 2016. -56p.
2. On the Strategy of Actions for the Further Development of the Republic of Uzbekistan. – T.: February 7, 2017, Decree No. PF-4947.
3. OO Khoshimov, Sh.B. Umarov “Automated electrical drives of industrial mechanisms” Tashkent 2020.
4. Basharii A.V. "Primery rascheta avtomatizirovannogo elektroprivoda na EVM" L: Mashinostroenie 1990g.
5. Lomako M.V. "Mikroprotsessornoe upravlenie promyshlennyx robotov" M: Mashinostroenie 1990g.
6. Smirnova V.K. "Proektirovanie i raschet avtomatizirovannyx privodov" - M:Vyssh.shk 1990g.

Internet websites :

1. www.ziyonet.uz .
2. http://e.lanbook.com .
3. http://www.library.ugatu.ac.ru .
4. www. s apr.ru.
5. www.tehnoinfo.ru .
6. www.elibrary-book.ru .