Name of subject	Electric machine manufacturing technology(ECTS 6)
Subject/module code	EMICHT2706
Science taught semester (s).	7th semester
Responsible teacher	Kushakov Gulmurod Adilovich, head teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	**Total hours-180.** **Audience Training hours - 72.** Lecture training hour – 24 Practical training hour – 24 **Independent education -108 hours**
ECTS	6
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject** To have an idea of the essence and social significance of the transition process in electrical machines and devices for his future profession; To know how to experimentally obtain and analyze the characteristics of the transition process in electrical machines and transformers used in electrical engineering and to be able to use them; The student must have skills in the theory, use and areas of application of the transition process in electrical machines and transformers. **The task of the subject** For the normal operation of electrical power systems and consumers, it teaches how to quickly identify damaged devices and power lines, disconnect damaged parts, and thereby create conditions for the normal operation of other electrical consumers and the electrical power system through electrical devices. **Learning outcomes:** Based on these tasks, within the framework of the tasks to be carried out in the process of mastering the academic discipline "Electric machine manufacturing technology", the bachelor should: 1. understand the main problems of this discipline in their relationship with a whole system of knowledge; 2. the essence and social significance of his future profession; 3. have an understanding of electrical machines and apparatuses; 4. be able to obtain and analyze the characteristics of electrical machines and apparatuses experimentally and be able to use them;
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions)** **Topic 1:** Introduction. Production technology of electrical machines and devices. **Topic 2:** Subject and methods of science. **Topic 3:** Magnetic cores and magnetic core manufacturing technology. **Topic 4:** Production technology of materials used in the manufacture of active parts of transformers **Topic 5:** Protection devices for general-purpose oil-immersed power transformers and autotransformers. **Topic 6:** The main technological processes in the production technology of transformer magnetic conductors. **Topic 7:** Magnetic materials **Topic 8**. Electrically conductive, superconducting, and cryoconducting materials **Topic 9:** Electrical insulating materials. **Topic 10:** Production technology of power transformer coils. **Topic 11:** Welding technology of electrical machine and transformer

	parts. **Topic 12:** Technology of machining parts and components of electrical machines **Topic 13:** Technology for stamping steel cores of electric machines. **Topic 14:** Technology of winding and insulation production. **Topic 15:** Collector and slip ring manufacturing technology. **Topic 16:**Technology for manufacturing short-circuited rotors of induction machines. **Topic 17:**Technology for balancing rotors of induction machines. **Topic 18:**Technology for manufacturing magnetic cores **Topic 19:**Technological documentation and technological preparation in production. **Topic 20:**General concepts of the technological process. **Topic 21:**Basic requirements for the manufacture of a synchronous generator. **Topic 22:**Technology for manufacturing asynchronous machines. **Topic 23:**Technology for manufacturing an asynchronous machine with a phase rotor. **Topic 24:**Technology for manufacturing non-polar plates of a synchronous generator. **Topic 25:**Electrically conductive, superconducting materials. **Topic 26:**Electrically cryoconducting materials. **Topic 27:**Technology for testing details of electrical machines **Topic 28:**Technological preparation in the production of electrical machines **Topic 29:**Basic requirements for the production of a synchronous generator. **Topic 30:**Electromagnetic (active), reactive and synchronous powers of a synchronous generator. **II.** Instructions and recommendations for organizing laboratory exercises. In laboratory exercises, students develop practical skills and qualifications in various indicators of processes in electrical networks and systems, conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions. Recommended topics for laboratory work: 1. Checking the characteristics and parameters of a three-phase two-phase transformer in short-circuit conditions by changing the number of windings. 2. Check the characteristics and parameters of a three-phase two-phase transformer by changing the number of windings under load. 3. Identify the connection groups of three-phase two-phase transformers. 4. Check the starting and short-circuit characteristics of a three-phase phase rotor asynchronous motor. 5. Check the operating characteristics of a three-phase phase rotor asynchronous motor. 6. Check the number of windings of an independent controlled variable current generator by changing the number of windings. 7. Check the number of windings of a parallel controlled variable current generator by changing the number of windings **III. Practical training instructions and recommendations** Lectures are held in an auditorium equipped with multimedia devices for the flow of academic groups. **The following topics are recommended for practical training**:

	1. Transformer tank calculation. 2. Transformer cover calculation. 3. Calculation of the main parameters of the transformer based on experimental data 4. Calculation of the resistance of the transformer tank. 5. Calculation of the resistance of the transformer tank. 6. Calculation of the transformer cover. 7. Calculation of the transformer cooling system. Load distribution in two transformers operating in parallel. 8. Calculation of the transformer radiator. 9. Calculation of single-phase stator winding 10.Determination of transformer resistance in the event of a short circuit. 11. Calculation of the rotor of an asynchronous motor. 12. Calculation of single-phase stator winding. 13. Starting an asynchronous motor using additional resistance 14. Determination of the operating characteristics of an asynchronous motor using a circular diagram of currents. 15. Determination of transformer resistance in the event of a short circuit. 16. Selection of special electrical steel sheet. **IV. Independent learning and independent work.** Features of this subject in the organization of independent education it is recommended to use the forms in the xdpda tune taken into account and considered as current control: Recommended topics for independent study: 1. Transformers on this. 2. General issues of alternating current machines. 3. Asynchronous machines. 4. Synchronous machines according to this. 5. Constant current machines 6. Development of technological processes. 7. Coils of electric machines. 8. Structure of magnetic cores. 9. Winding of transformer coils
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. Vhattachrya. Electrical machinees 3E book. 2008, N/A p. 2. Fitzgerald. Electric machinery, 6/E book. 2002, N/A p. 3. Berdiev U.T., Pirmatov N.B. Elektromexanika. Texnika oliy oquv yurtlarining «Elektr texnikasi, elektr mexanikasi va elektr texnologiyalari» va ” elektr energetika” yonalishi talabalari uchun darslik.–T.: Shams-Asa. 2014. –386 b. 4.Pirmatov N.B., Mustafakulova G.N., Mahmadiev G‘.M. «Elektr mashinalari» kursidan «Asinxron motorlarni loyihalash». O‘quv qo‘llanma. -T.: ToshDTU, 2013. –95 b. 5.Salimov J.S., Pirmatov N.B. Elektr mashinalari. Darslik.-T.: O’zbekiston faylasuflari milliy jamiyati nashriyoti, 2011. – 408 b. 6.Ibrohimov U. Elektr mashinalari. O‘quv qo‘llanma. – T.:O‘qituvchi, 2001. 7. Majidov S. Elektr mashinalari va elektr yuritma. O‘quv qo‘llanma. –T.: O‘qituvchi, “Ziyo-Noshir” KSHK, 2002. – 408 b. **Additional literature:** 8. Mirziyoev 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. 9. Mirziyoev 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. 10. Mirziyoev SH.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – T.: “O‘zbekiston” NMIU, 2017. – 488 b. 11. O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha Harakatlar strategiyasi to‘g‘risida. – T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 12. N.B. Pirmatov, Z.A. Yarmuxamedova, G.N. Mustafakulova. Elektr mashinalari fanining transformatorlar qismi bo‘yicha kurs loyihasini bajarishga oid o‘quv-metodik qo‘llanma. –T.: ToshDTU, 2012 – 117 b. 13. Katsman M.M. Sbornik zadach po elektricheskim mashinam. Ucheb. Posobie dlya vuzov. –Moskva.: – Izdatelskiy sentr «Akademiya». 2012. –154 s. 14.Mustafakulova G.N.,Toshev SH.E. Elektr mashinalari fanidan laboratoriya mashg‘ulotlarini bajarish uchun metodik ko‘rsatma. –T.: TDTU, 2015. – 45 b . 15. Pirmatov N.B., Zaynieva O.E. Elektromexanika (Elektr mashinalari) fanidan masalalar to‘plami. O‘quv qo‘llanma. –T.: TDTU, 2004. – 75 b. **Internet resources:** 16. www.Ziyo.net 17. http://dhes.ime.mrsu.ru/studies/tot/tot_lit.htm; 18.http://rbip.bookchamber.ru/description.aspx?product_no=854; 19. http://energy-mgn.nm.ru/progr36.htm 20. http: //www.unilib.neva.ru/dl/059/Head.html