

Name of discipline	Russian language (ECTS 4)
Module/Discipline Code	O'RT1204
Science taught semester (s).	2 nd semester
Responsible teacher	Abduvakhobova Dildora Erkinovna, associate professor
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 120 Audience Training hours - 48 Practical hours - 48 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching discipline. The aim of the discipline is to acquire language knowledge, develop and improve speech skills and abilities in Russian in areas relevant to students: educational and scientific, professional, social and cultural. As well as the development of oral speech, the formation of knowledge of the spelling and punctuation norms of the Russian language, increasing the spelling and punctuation literacy of students, improving the proficiency in written and oral forms of the literary language; developing skills in using spelling and punctuation rules in practice, and the ability to analyze and correct grammatical errors of various types. Objectives of the academic discipline. The objectives of the course are to systematize, supplement and deepen knowledge of the Russian language acquired at school, academic lyceum and professional college; to improve students' spelling and punctuation literacy; to develop skills in using spelling rules in practice; to teach students to clearly and stylistically correctly express their thoughts, to improve their fluency in the oral and written forms of the Russian literary language; to improve skills of professional activity in Russian, communicative orientation of training; to prepare students for work with literature (in the chosen specialty, socio-political, popular science, journalistic, fiction). Reading - development of skills and competencies in skimming, fluent and attentive reading; reading letters, correspondence and e-mail; reading authentic texts reflecting specific materials; reading texts with special words and terms, scientific and professional literature, electronic sources and press materials; Written speech - writing various correspondence, letters and special reports (memos, etc.); writing essays, applications, resumes, research papers (articles, final qualifying works); Listening - listening to authentic materials twice in order to understand the main content, extract the necessary information and be able to express it; understanding daily news, reports, speech of movie characters. A Field of study (Direction) knowledge and skills to the industry: The main goal of the professional stage is: - Practical mastery of a foreign language in the professional sphere by types of speech;

- Development of the student as a creative person;
- Development of skills and abilities in translating fiction on professional topics.

1. Reading:

Working on a text (1200-1500 characters) on various topics and areas of study per week during the school year.

2. Writing:

- writing greeting cards;
- writing informal and formal letters;
- writing summaries of texts on various topics;
- writing essays of 200-250 words on various topics.

3. Listening: - listening to and understanding complex authentic speech in familiar and unfamiliar contexts, including radio, internet and television programs and interviews broadcast on them.

4. Говорение:

General topics - about yourself, your family, work day, hobbies, spending free time, everyday life, etc.;

Social topics - everyday issues, personal and professional psychology and ethics, environmental protection, global problems;

Sociocultural topics - cultural differences in scientific and industrial situations, the world and countries whose languages are studied, their cultural and social characteristics, foreign language and its role;

Educational topics - education system, continuous education, leading universities of the world, strategies for writing, reading, studying and presenting lectures, research papers, dissertations;

Topics related to the Internet and information technology - world and domestic scientific and technical news, achievements, discoveries and inventions, use of the Internet, the latest technologies;

Topics related to the area of specialization - industry trends, current topics, document flow, professional ethics, negotiations, scientific and practical achievements in the area of specialization, innovative ideas and innovations, leading scientists in the field and their role in science.

Learning outcomes:

Directing knowledge and skills to industry topics;

The main goal of the professionally oriented stage:

- Practical mastery of the Russian language in the professional sphere by types of speech;
- Developing the student as a creative person;
- Developing skills and abilities in translating industry-related literature.

When organizing, conducting practical classes and assessing students' language acquisition, internationally recognized criteria for language acquisition are used:

1. Listening competence:

Level B2 - understands longer speeches given in lectures or on television, more complex speeches on familiar topics, understands the main ideas of topics discussed when listening to and watching news broadcasts on TV and radio, understands the content of films shown in literary language.

2. Reading Competence:

	Level B2 - should be able to read and understand articles on current topics, and should also be able to read and understand the content of contemporary prose works. This is due to the fact that when reading a work, the student is expected to focus on the main idea, and not on its literal translation. 3. Written competence: Level B2 - the student should be able to provide information on topics of interest to him and express his opinion on them in writing, clearly express his point of view on the topic, negative or positive aspects in writing; Oral (dialogue, monologue) competence: Level B2 (dialogue) - the student should be able to communicate freely with native speakers, actively participate in discussions on familiar topics, as well as interview native speakers and, in turn, answer their questions. Monologue - the student must be able to construct clear and detailed sentences on topics of interest to him, describe events and objects related to the relevant topic
Course Contents (Topics)	I. Main part (Practical classes) Topic 1. Phonetic and orthoepic norms of the Russian language. Topic 2. Lexical wealth of the Russian language (poly-semantic words, direct and figurative meaning of words, archaisms, neologisms, borrowed words, synonyms, antonyms, homonyms, phraseological units.) Topic 3. Noun. Categories of gender and number. Declension of nouns. Topic 4. Pronoun and its classification. Declension of pronouns; Topic 5. Adjective and its classification. Topic 6. Numeral as a part of speech. Topic 7. Preposition. Synonymous use of prepositions. Topic 8. Cases in Russian. Topic 9. Verb as an independent part of speech. Topic 10. Unidirectional and multidirectional non-prefixed imperfective verbs. Topic 11. Use of prefixes: <i>в-, во-, над-, до-, от-, ото-, с-, со-, при-, непе-, у-, по-, про-</i> with verbs of motion; Topic 12. Types of sentences by the purpose of the utterance. Complex sentence, its types. Topic 13. Subject of a sentence and types of its expression. Topic 14. Predicate and types of its expression: simple verbal, compound verbal, nominal. Topic 15. Definition. Definitive relations in the structure of a phrase and a simple sentence; Topic 16. Circumstance, its types; Topic 17. Supplement. Topic 18. Expression of object-explanatory relations in simple and complex sentences. Topic 19. Expression of temporal relations in a complex sentence. Topic 20. Expression of attributive relations in simple and complex sentences. Topic 21. Expression of target relations in simple and complex sentences. Topic 22. Expression of spatial relations in simple and complex sentences. Topic 23. Expression of cause-and-effect relations in simple and complex sentences.

Topic 24. Expression of conditional and concessive relations in simple and complex sentences;

III. Instructions and recommendations for conducting practical classes;

Preparing a teacher to conduct practical classes begins with studying the source documents (curriculum, subject plan, etc.) and ends with developing a lesson plan. The teacher must have an idea of the goals and objectives of practical classes, the amount of work that each student must complete. Methodological instructions are the main methodological document of the teacher when preparing and conducting practical classes.

In practical classes, the emphasis is on developing students' speech (reading, writing, listening, speaking), language (lexical, grammatical), socio-cultural and pragmatic competencies in accordance with the requirements of the State Standard for Language Study;

Attention is also paid to the development of oral and written presentation skills and qualifications on topics related to scientific, professional and everyday activities, familiarization with universal and national values, and the cultivation of a sense of intercultural tolerance. and interethnic solidarity, teaching terms and concepts used in scientific and professional activities;

The goal of practical classes is to master the theory and acquire skills. This is its conscious application in educational and professional activities, developing the ability to confidently form one's own point of view.

IV. Independent (Self-study) and independent work.

The competence of independent learning serves to support the independent self-development of students and to increase the efficiency of professional activity. Students perform independent work on their mobile devices under the guidance of a teacher in traditional or electronic form.

Completion of practical subject assignments: independent study of individual topics, questions contained in educational literature; preparation of written answers to problematic questions (according to the principle of the "Three-Part Diary" of "POPS-formula", "Mind Map", "Thin and Thick Questions"); presentation of the results of independent research and their presentation; study of literature in the specialty, fiction and broadening of horizons, increasing the professional and cultural level; compilation of a card index of literature in the specialty;

Self-study of recommended topics:

1. Write an essay on the topic: "A person you want to imitate". "Make up Mind Map" and a glossary. Talk about mechanical engineering in your area. Prepare a presentation;
2. Write a story about your family using thematic vocabulary. Compare Uzbek and Russian languages using the "Method of Correspondences", prepare a presentation;
3. Find in the fiction text a description of the portrait and character of the heroes of the works. Create a "Cluster", a glossary and write an abstract on the fiction text;
4. Select proverbs and sayings in Russian and Uzbek about the language. Create a "Three-Part Diary" technology, a glossary, and prepare a presentation;
5. Write a report about a famous linguist, using the method "Thin and thick questions", make a glossary;
6. Work on the text K. Paustovsky "Basket with spruce cones". Make a "POPS formula", a glossary;
7. Translate short excerpts from works of native literature into Russian.

	Create a “Mind Map”, a glossary; 8. Tell about famous scientists from your homeland. Prepare a presentation. Create a cluster, a glossary and write an essay. 9. Find statements by great people in Russian and Uzbek about learning, books, and work. Comment on them. Make a “Two-Part Diary,” a glossary, write an essay. 10. Prepare a presentation and write a report on the topic: “Uzbekistan”, “My Native Land in the Modern World”. (15-20 sentences). 11. Visit a local history museum, get acquainted with the fauna and flora of Uzbekistan in the nature hall. Write an essay about the nature of your native land. Make a glossary, prepare a presentation. 12. Tell us about the Uzbek Olympians you know. Prepare a presentation. Translate short excerpts from Russian literature (A.S. Pushkin) into your native language.
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	50 points	System tasks	40 points (divided by the number of tasks)	30 points	
			Student activity (in seminars, practical, laboratory classes)	10 points		
	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. Akhmedova N.F. “Russian language”. Study guide. 2006. 2. Akhmedova L.T., Lagai E.A. Modern technologies for teaching Russian language and literature. – T. 2016. 3. Rakhimova S. Textbook on the Russian language. 2005. 4. Baysariev N. Russian language, Jizzakh 2019. 5. Abduvakhobova D.E. Electronic textbook “Russian language”. (license from 28.06.20.05.2022 No. DGU20222891). 6. Ziyaeva M.F. Electronic textbook “Russian language”. (license from 06.04.2022 No. DGU20221591). 7. Khazratkulova A.V. Russian grammar for national groups. Textbook. 2022.					
	Additional literature: 1. Mirziyoyev Sh.M. Strategy of actions on five priority directions of development of the Republic of Uzbekistan in 2017-2021. – PP “On the strategy of actions for further development of the Republic of Uzbekistan” (Collection of Legislation of the Republic of Uzbekistan, 2017, No. 6, art. 70, No. 20, art. 354). 2. Mirziyoyev Sh.M. Critical analysis, strict discipline and personal responsibility should become the daily norm in the activities of each leader. Report at the extended meeting of the Cabinet of Ministers dedicated to the results of the country's socio-economic development in 2016 and the most important priority areas of the economic program for 2017. January 14, 2017 - T. Uzbekistan, 2017. - 104 p. 3. Bulgakova L.N. and others. My friends case. – M.: Russian language, 2011.					

4. Nagaytseva N.I, Kropotova E.A. Verb: aspect, tense, control. Kharkov NTU “KhPI” 2008
5. Kamilova M.G. and others. Manual for teaching Russian language. – T. 2009.
6. Tashtemirova Z.S. Practical course of the Russian language - T. 2004.
7. Akhmedova M.Kh. Russian language. Study guide. - T., TUIT, 2016
8. Karieva Sh.M. Business Russian. Study guide for students of economic profile universities - TSUE, Tashkent 2002.
9. Yusupov K. Prepositional-case constructions of the Russian language. Study guide. 2022.
10. Karimov F. Russian language. Study guide. 2023.

Information and educational resources:

1. Russian Encyclopedia. ABC. - M., 2007. (electronic video materials)
2. <http://ziyonet.uz/ru/library>
3. <http://ek.nuu.uz/>
- 4.e-mail: kursy@online.ru (manuals)
- 5.<http://slovari.yandex.ru> 6.www.gramota.ru.
- 7.www.krugosvet.ru (reports, abstracts)
- 8.www.google.ru (search engine).
- 9.<http://magazines.russ.ru/> noviy.mir/ (magazines).

Name of subject	Religious Studies (ECTS 4)
Subject/module code	DIN1204
Science taught semester (s).	2 nd semester
Responsible teacher	Khidirov Khoshim Ibodullayevich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 120 Audience Training hours - 60 Lecture hours - 30 Practical hours - 30 Independent education - 60 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching science is to form theoretical knowledge and practical skills in the minds of students and young people to understand the essence of religion, the religious picture of the world, the interrelationship of religious and philosophical views, globalization and religious processes, as well as the negative impact of modern religious movements, religious fanaticism, extremism and terrorism on the security of the state and society, and to combat them. The task of science is to study the history and stages of development of religious teachings, to form the ability to distinguish the true meaning of religion from its false interpretations; - to identify the causes of the emergence of extremism and terrorism, and to analyze its consequences from a socio-philosophical perspective; - to develop logical and critical thinking skills in relation to religious and secular processes, - to apply the acquired theoretical knowledge in practical life in the prevention and fight against religious fanaticism, - to develop the student's skills in using the acquired knowledge in independent learning. Learning outcomes As a result of mastering the subject, the student will: • have an idea of the essence of religion, its role in society and the life of the individual, the proportionality of secular and religious sciences, the relationship between religion and science, the goals of religious education and secular education; • through the study of the subject of religious studies, the essence of different religions, the differences and commonalities between their traditions and beliefs, the role of religious and secular knowledge in educating people's tolerance and mutual respect, analysis of world religions, beliefs and customs, traditions, religious and moral ideas; the main concepts, functions of religious studies, the religion of Buddhism and its ideas; the history and main ideas of Christianity, the main ideas of the Catholic Orthodox religion and their differences in the years, pluralism in Protestantism, views on Islamic teachings: Sunnism, Shiism and foreigners, their orientation and essence; the relationship between ideas about theology and the Mu'tazilite school; knowledge of the sources and factors that gave rise to religious fundamentalism, extremism, fanaticism and be able to use them; • understanding the essence of religious belief in local customs, traditions, the culture of general tolerance and communication with believers and non-believers of different religions; must have the skills to combat spiritual threats and information attacks artificially associated with the name of religion.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: The importance of religion as a socio-cultural phenomenon Topic 2: National religions

Topic 3: Zoroastrianism
 Topic 4: Buddhism
 Topic 5: Christianity
 Topic 6: Islam
 Topic 7: Doctrinal directions and schools of Islam
 Topic 8: The role of the Hanafi school in the history of Central Asia
 Topic 9: Religious organizations operating in Uzbekistan
 Topic 10: Modern religious movements and sects
 Topic 11: Social dangers of religious propaganda in cyberspace
 Topic 12: Political and social dangers of missionary work and proselytism
 Topic 13: History and trends of religious fundamentalism, radicalism and terrorism
 Topic 14: The role of the world community experience of combating extremism and terrorism
 Topic 15: The importance of achieving unity of secular knowledge and religious beliefs

II. Instructions and recommendations for the seminar

The teacher's preparation for a practical session begins with the study of preliminary 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 instructions are the main methodological document of the teacher in preparing and conducting practical sessions.

The purpose of the seminar session is to understand the theory, acquire skills. It is to develop the ability to consciously apply it in educational and professional activities, and to confidently form one's own point of view.

Recommended practical topics:

1. Subject and functions of the discipline of religious studies.
2. Methodology of religious studies and classification of religions
3. Social significance of the psychology of religion
4. The role of national religions in ensuring social development and personal faith
5. The influence of Buddhism and Christianity on the development of society
6. Stages of formation of Islamic thought and culture.
7. History of formation of the sciences of the Quran, hadith, jurisprudence, and aqeedah
8. Islamic law and sources
9. Sufism and the present time
10. On the factors of education of the spiritual culture of Islam
11. Dynamics of the activities of religious organizations and confessions in Uzbekistan
12. Negative impact of missionary work and proselytism on the choice of religious faith.
13. Religious fundamentalism, radicalism and terrorism as a threat to security
14. The importance of the fight against terrorism by international organizations
15. The role of religious pluralism, religious tolerance, and tolerance in the life of society.

III. Independent learning and independent work.

Independent learning competence serves to assist students in independent self-development and increase the effectiveness of professional activity. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

	Independent learning for recommended topics: 1. The essence of the concepts of religion, religious studies, philosophy of religion, theology, theosophy, piety, religious belief, creed, theology. 2. The formation of religious studies as a science, its subject, functions, categories. 3. Methodology for studying religions: typological, comparative, structural-functional, genetic analysis. Methods of comparative religious studies. 4. Judaism, traditions and rituals. 5. Socio-ethical issues in Confucianism. 6. Theological system and religious rituals of Zoroastrianism. 7. The glorification of nature in Zoroastrianism. 8. The religious hierarchy of Zoroastrianism. 9. The history of the emergence of Buddhism, its main teachings, trends and sources. 10. The historical roots of Buddhism in Uzbekistan (Qaratepa, Fayoztepa, Dalvarzintepa) and the present day. 11. The emergence of Christianity, its beliefs, main directions, teachings and sources. 12. Socio-political and cultural conditions in the emergence of Islam. 13. The essence of the reforms during the reign of the Rashid Caliphs. Attitude to religion during the reign of the Umayyads and Abbasids. 14. The impact of the spread of Islam and the formation of madrasah education in Transoxiana on socio-cultural life. 15. The essence of eschatology: the world of the resurrection and the afterlife. 16. The reasons for the emergence of Islamic movements and trends, the causes and consequences of divisions in their beliefs. 17. The role and contribution of Central Asian jurists in the development of the Hanafi school. 18. The concept of Sufism and its essence. The origin, content and development of Sufism. 19. The essence of the concept of confession and the classification of religious confessions operating in Uzbekistan. 20. The importance of adapting religious organizations to modern secular standards. 21. Definition of freedom of conscience and belief. 22. History of religious teachings formed as a result of the syncretization of Islam and other religious beliefs. 23. The essence of the concepts of cyberspace, cyberterrorism, cyberbullying. 24. The need to cultivate a culture of religious information consumption in social networks. 25. Modernization of methods and tools in missionary propaganda: ideological threats in cyberspace. 26. Missionary movements observed in Uzbekistan and the consequences of their activities. 27. Socio-historical foundations of the emergence and development of religious fanaticism (fanaticism), extremism. 28. Directions of combating radical movements in the state policy of Uzbekistan. 29. Uzbekistan's experience in combating terrorism. 30. The importance of studying the ideas of moral education of Uzbek youth in religious sources
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	20 points	Supervision:	10 points	12 points	

	<table><tr><td>assessment</td><td></td><td>Written work</td><td></td><td></td></tr><tr><td></td><td></td><td>System tasks</td><td>10 points (divided by the number of tasks)</td><td></td></tr><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* 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.</td></tr></table>	assessment		Written work					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.				
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Recommended Literature	Main literature 1. Muratov D., Alimova M., Karimov J. Religious studies, textbook. – Tashkent, “Navru’z” publishing house, 2019. – 264 p. 2. Rakhimdjanov D., Ernazarov O. Introduction to religious studies. Textbook. – T.: “National Society of Philosophers of Uzbekistan” publishing house, 2018. – 304 p. 3. Isokjonov R. Comparative religious studies. Textbook. – T.: OOO “Complex print”, 2020. – 198 p. 4. Kamilov D. Religious studies. Textbook. – T.: Lesson Press, 2021. – 128 p. 5. Shermukhamedova N.A. The phenomenon of religious fanaticism//Human philosophy. – T.: Publisher, 2016. P.314-499. Additional literature 1. Mirziyoyev Sh.M. We will continue our path of national development with determination and take it to a new level. T. 1. - Tashkent: Uzbekistan.. 2017. 2. Mirziyoyev Sh.M. We will build our great future together with our brave and noble people. - Tashkent: Uzbekistan. 2017. 3. Mirziyoyev Sh.M. We will build a free and prosperous, democratic state of Uzbekistan together. - Tashkent: Uzbekistan. 2017. 4. Mirziyoyev Sh.M. The consent of our people is the highest assessment of our activities. Tashkent: Uzbekistan, 2019. 5. Mirziyoyev Sh.M. The work of a people with great intentions is also great, their life is bright and their future is prosperous. Tashkent: Uzbekistan, 2019. 6. K. S. Guttenplan. J. Hornsby. C. Janaway. Reading philosophy. Blackwell Publishers Ltd. UK. 2003. R – 341. 7. A. Azami. Introduction to hadith studies. Kazan: 2011 8. A. Fitrat. Selected works – Tashkent: Ma’naviyat, 2010 -301 p 9. Abu Khomid Ghazzali Kimei saodat//Knowledge leading to the bliss of two worlds. - Samarkand: Imam Bukhari International Center, 2019 10. Rumi J. Masnavi. Commentary on 40 narrations. - Tashkent: Navruz, 2019 11. Abu Khomid Ghazzali Kimei saodat//Knowledge leading to the bliss of two worlds. - Samarkand: Imam Bukhari International Center, 2019 12. Islamov Z., Haydarov I. Christianity: Temple, Worship and Rituals. – Tashkent: Qaqnus Publishing House, 2020. 13. G’oyibnazarov Sh. Islam against terrorism. – Tashkent: “O‘zbekiston” NMIU, 2021. 14. David L. McMahan. The Making of Buddhist Modernism. – Oxfordshire: “Oxford University Press”, 2008. 15. Todd M. Johnson. Religious Adherents of the World by																				

	Continent and Region // Religions of the World: A Comprehensive Encyclopedia of Beliefs and Practices / J. Gordon Melton, Martin Baumann. – Oxford, England: “ABC CLIO”, 2010. Information sources 1. www.ziyonet.uz. 2. www.edu.uz. 3. www.google.uz. 4. www.gov.uz.

Name of subject	Chemistry (ECTS 4)
Subject/module code	KIM1104
Science taught semester (s).	1 st semester
Responsible teacher	Khakberdiev Shukhrat Makhramovich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120. Audience Training hours – 48 Lecture training hour –24 Laboratory training hour – 12 Practical training hour – 12 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject The goal is to develop the student's ability to think chemically, apply chemical laws in modern technology, familiarize themselves with and study the properties of materials and substances used in technology, and develop the skills to apply them in practice. The task of the subject to reveal the role and importance of a specialist in his work by forming theoretical knowledge, practical skills, a methodological approach and a scientific worldview necessary for logical observation of the content of chemical phenomena and processes. The purpose of "Green Chemistry" is to develop practical skills in students on the 12th principle of "Green Chemistry", which is to select synthesis methods in the following chemical processes, to achieve that reagents and substances obtained are less harmful to humans and the environment when choosing synthesis methods, to reduce toxicity while maintaining their effectiveness when creating new chemicals, to avoid the use of toxic additional solvents and separating reagents in production, to always try to choose the most selective catalytic processes, and to minimize chemical hazards such as explosions, combustion and leakage of substances used in chemical processes. Learning outcomes: As a result of mastering the subject, the student should: • have the skills to connect the theoretical knowledge being studied with practice; • have the ability to know the relationship of the phenomena being studied and to objectively describe them; • know the laws and properties of chemistry and be able to use them; • understand the program materials and have an imagination in the process of preparing for classes on chemical compounds
Course content (topics)	I. Module 1. Introduction. Basic concepts and laws of chemistry Topic 1. Basic concepts of chemistry. Basic laws of chemistry Introduction. Chemical science and industry in Uzbekistan. Purpose, tasks of chemistry. Basic concepts of chemistry: atom, molecule, gram-atom, gram-molecule, chemical compound, chemical element, chemical formula, chemical reaction, chemical equation. Simple and complex substances. Classes of inorganic compounds. Basic laws of chemistry. Stoichiometric laws: Law of conservation of mass of matter. Law of constancy of composition of matter. Law of equivalents. Law of multiple proportions. Avogadro's law. Topic 2. Atomic structure. D.I. Mendeleev's periodic table of elements. Types of chemical bonds Atom is a complex system. Atomic structure. Atomic nuclei. Electron

clouds of an atom. Bohr's postulates. The order and regularity of filling atomic orbitals with electrons. Electronic configuration. Normal and excited states of atoms.

D.I. Mendeleev's periodic table of elements. Dialectical description of the periodic law. Change in the properties of chemical elements. The general significance of the periodic system and the law.

The concept of chemical bonding. The main types of chemical bonding and their interrelationships. Ionization energy. Electron affinity. Electromagnetic affinity of elements. Covalent bonding. Types of covalent bonding. Bond polarity. Ionic bonding. Hydrogen bonding. Coordination bonding. Mechanism of formation of donor-acceptor bonds in complex compounds. Types of crystal lattices. Metallic bonding.

Topic 3. Chemical kinetics and chemical equilibrium. Information about chemical kinetics. Chemical reaction rate and factors affecting it. Homogeneous and heterogeneous reactions. Effect of concentration on reaction rate. Law of mass effect. Rate constant. Van't-Hoff's rule. Catalysts. Catalysis. Homogeneous and heterogeneous catalysis.

Reversible and irreversible reactions. Chemical equilibrium and factors affecting it. Shift of equilibrium. Le Chatel's principle. Equilibrium constant. Importance of chemical kinetics and equilibrium in industry.

Topic 4. Water. Properties and hardness of water. Water in nature. Structure of the water molecule. Phase diagram of water. Physical and chemical properties of water. Water hardness and methods of its removal. Importance of water in human health, national economy and technology.

Topic 5. Solutions. Disperse systems and their description. Classification of disperse systems. Coarsely dispersed systems. Colloidal solutions. Pure solutions. Diluted, concentrated solutions. Saturated, unsaturated and supersaturated solutions. Concentration of solutions. Solutions with percent, molar, normal and molal concentrations. Titer of the solution. Solubility. Use of solutions and their role in technology.

Topic 6. Theory of electrolytic dissociation. Ionic equations. Hydrolysis of salts

Electrolyte and non-electrolyte solutions. Aqueous solutions of electrolytes. Electrolytic dissociation. S. Arrhenius theory. Acid and base theory. Stepwise dissociation. Degree of dissociation. Strong and weak electrolytes. Dissociation constant. The importance of the theory of electrolytic dissociation in technology.

Properties of electrolyte solutions, ionic activity. Ionic equations of solutions. Solutions of acids, bases, and salts and ion exchange reactions between them. Ionic density of water. Solution environment. Indicators. Hydrogen indicator. Hydrolysis. Types of hydrolysis of salts. Degree and constant of hydrolysis. Industrial applications of hydrolysis.

Module 2. Electrochemistry

Topic 7. Redox reactions. Oxidation degree and valence. Types of chemical reactions. Theory of redox reactions. Oxidants and reducing agents. Types of redox reactions. Methods for constructing equations of redox reactions: electron balance and ion-electron methods.

Topic 8. Electrochemical processes. Electrochemistry. The concept of electronic potentials of metals. Hydrogen electrode. Voltage series of metals. Nernst-Tyurin equation. Galvanic elements and their mode of operation. Electromotive force. Use of galvanic elements and their role in technology.

Electrolysis. Processes occurring at the anode and cathode. Insoluble and soluble anodes. Laws of electrolysis. The importance of electrolysis in industry. Methods of galvanoplastics and galvanostegy.

Module 3. Chemistry of metals

Topic 9. General properties of metals. Alloys. Distribution and

occurrence of metals in nature. Production of metals. Physical properties of metals. Chemical properties of metals. Dependence of the properties of metals on their location in the periodic system of elements of D.I. Mendeleev. Light and heavy metals. Use of metals.

Alloys. Types and properties of alloys. Phase diagrams. Physicochemical analysis of metal alloys. Intermetallic compounds and solid solutions of metals. Production and importance of alloys in industry.

Topic 10. Corrosion of metals and methods of protection against it. Main types of corrosion. The harm caused by corrosion to the national economy. Chemical corrosion of metals. Electrochemical corrosion and its types.

Combating corrosion of metals. Methods of protecting metals from corrosion. Isolation of metals from aggressive environments, protective layers. Electrochemical protection methods (protective, cathodic and anodic protection). Changing the properties of the corrosive environment, corrosion inhibitors and activators. The economic importance of protecting metals from corrosion.

Module 4. Fundamentals of organic chemistry

Topic 11. Classification of organic compounds. Formation of organic compounds and organic chemistry. Theoretical views on the chemical structure of organic compounds. A.M. Butlerov's classification of organic compounds. Hydrocarbons. Saturated and unsaturated hydrocarbons. Alcohols, aldehydes, ketones, carboxylic acids, esters, nitrogenous organic compounds.

Topic 12. High molecular compounds. High molecular compounds. Polymers and elastomers. Polymerization and polycondensation reactions, their mechanisms. Physicochemical, mechanical properties and uses of polymers and elastomers. Composition of plastics and elastomers. Application of plastics and elastomers in technology.

II. Instructions and recommendations for practical training:

The purpose of practical training is to understand the theory, acquire skills. It is to develop the ability to consciously apply it in educational and professional activities, to confidently form one's own point of view.

1. Classes of inorganic compounds. Basic laws of chemistry.
2. Atomic and molecular structure.
3. Thermochemistry.
4. Chemical kinetics and equilibrium.
5. Hydrolysis of electrolyte solutions and salts.
6. Oxidation-reduction reaction. Corrosion of galvanic elements and metals.

III. Instructions and recommendations for laboratory exercises:

1. Safety rules in chemical laboratories. Familiarity with chemical containers and equipment. Classes, production and properties of inorganic compounds. Determination of the equivalent of a metal relative to hydrogen.

2. Factors affecting the rate of a chemical reaction. Chemical equilibrium. Shift of equilibrium.

3. Determination of water hardness. Determination of solution concentration.

4. Properties of strong and weak electrolytes. Ionic equations. Hydrolysis of salts.

5. Oxidation-reduction reactions. Electrochemistry. Galvanic cell. Electrolysis process.

6. Chemical properties of metals. Corrosion of metals and methods of preventing it.

The student consolidates the theoretical knowledge gained from lecture classes of the subject in educational laboratory exercises. The student performs laboratory work under the supervision of a laboratory assistant and completes a report and submits it to the subject teacher.

	IV. Independent learning and independent work The competence of independent learning serves to assist students in independent self-development and increase the effectiveness of professional activity. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form. 1. The importance of chemistry in the national economy. 2. The development of the chemical industry in Uzbekistan. 3. Uzbek chemists. 4. The basic laws of chemistry. 5. Atomic structure. 6. D.I. Mendeleev's periodic law and the periodic table of elements. 7. Types of chemical bonds. 8. Structure of matter. The method of valence bonds and molecular orbitals. 9. Thermochemistry. 10. Chemical kinetics. Chemical reaction rate. 11. Chemical equilibrium. Equilibrium shift. 12. Water in nature. Water hardness. 13. Water hardness and methods of softening it. 14. Redox reactions. 15. Fundamentals of electrochemistry. 16. Batteries. Their types. 17. General properties of metals. 18. Metallurgical industry in Uzbekistan. 19. Alloys. 20. Corrosion of metals and methods of preventing it. 21. Characteristics of s-group elements. 22. p-elements. Their properties. 23. d-elements. Their properties. 24. d-elements of groups I-II (Cu, Zn, Ag, Au). 25. f-elements. Lanthanoids and actinoids. 26. Classification of organic compounds. 27. Saturated and unsaturated hydrocarbons. 28. Polymer chemistry and polymer materials. 29. Plastic masses, their importance in the national economy. 30. Mineral binders. Their importance in the national economy.
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. Axmerov Q.A. va boshqalar, Umumiy va anorganik kimyo, Darslik. T.: O'zbekiston, 2017. 226 b. 2. Parpiyev N.A. Muftaxov A.T., Raximov N.R., Anorganik kimyo, Darslik. T.: O'zbekiston, 2003. 215 b. 3. Н.Л. Глинка Общая химия: Учебное пособие - М.: Интеграл-Пресс, 2002. 732 с. 4. Ахметов, Н.С. Общая и неорганическая химия / Н.С.Ахметов. - М.: Высш. шк., 2001. - 743 с. 5. Soren Prip Beier & Peter Dybdahl Hede. Essentials of Chemistry. 2013. - 180 b. 6. И.К. Доманский Строительные материалы и изделия Учебное пособие Издательство Уральского университета 2018. 208 стр. 7. Е.И.Тупикин. Химия в строительстве Учебное пособие Москва: Юрайт 2019. 181 с. 8. Г.Г. Савельев, Л.М. Смолова Общая химия Учебное пособие Издательство Томского политехнического университета 2006. - 204 с. 9. Л.Г. Коляда, Л.Г. Тарасюк Химия Учебное пособие Магнитогорск 2015. 128 с. 10. Гаршин А.П. Общая и неорганическая химия в схемах, рисунках, таблицах, химических реакциях: Учебное пособие - СПб.: Питер 2011. - 288 с. 11. M.B.Matchanova, D.A.Xolmo'minova, S.Yu.Bobomuratova "Qurilish kimyosi" o'quv qo'llanma (qayta nashr). Jizzax-2023. 12. M.N.Pozilov, D.A.Xolmo'minova, A.A.Bo'riboyev. "Kimyo". Darslik. Toshkent-2022. 13. M.B.Matchanova. "Kimyo" Darslik. Toshkent-2022. Additional literature: 14. Sh.M.Mirziyoyev. Erkin va farovon demokratik O'zbekiston davlatini birgalikda barpo etamiz. - T.: O'zbekiston. 2016. 15. O'zbekiston Respublikasi Prezidentining "O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi" to'g'risidagi farmoni. Xalq so'zi gazetasi. 2017 yil 8-fevral. 16. Yoriyev O.M. va boshqalar. Umumiy va anorganik kimyodan masala va mashqlar to'plami. O'quv qo'llanma. T.: O'z.fay. MJ. 2008. -216 b. 17. Q.M.Ahmerov, S.M.Turobjonov, S.Y.Saparov Umumiy va noorganik kimyodan laboratoriya mashg'ulotlari o'quv qo'llanma. Toshkent, O'zbekiston, 2019. 18. A.M.Eminov, Sh.M.Xakberdiyev., I.R.Ro'zmatov., F.S.Karimova "Umumiy va anorganik kimyodan amaliy va laboratoriya mashg'ulotlari" o'quv qo'llanma. Toshkent-2021. 19. M.B.Matchanova. "Kimyo fanidan laboratoriya ishlari" Darslik. Toshkent-2023. Internet resources: 1. Elektron kutubxona ma'lumotlari. www.ziynet.uz 2. Online publishing company of eBooks. www.bookboon.com 3. Alisher Navoiy nomidagi O'zbekiston Milliy kutubxonasi. www.natlib.uz 4. O'zbekiston Respublikasi hukumat portali. http://www.uzbekistan.uz 5. Online publishing. http://www.e-plastic.ru

Subject name	Foreign language (ECTS 8)
Subject/module code	XT11208
Semesters taught	1 st and 2 nd semesters
Attached teacher	Mustafoqulova Hulkar Ahmedovna, associate professor
Language of instruction	Uzbek
Connection to the curriculum	Compulsory
Study hours (including independent study)	Total hours - 240 . Auditorium (Classroom) hours - 96 Lecture hours - Laboratory hours - Practical hours - 240 Independent learning -144 hours
ECTS	8
The purpose and objectives of science / learning outcomes	The purpose of teaching the subject: The purpose of teaching a foreign language in non-philological areas is to teach students the oral and written forms of the language in an integrated manner, develop communication skills in various contexts, in particular, to improve their practical and theoretical knowledge of the foreign language skills being studied, and to ensure that they can freely use the acquired knowledge, skills, and competencies in professional and scientific activities. The task of the subject is to teach the necessary language skills and develop communication skills in an integrated manner to master the foreign language being studied at level B2 according to generally recognized international standards. In practical classes conducted in a foreign language, all language skills - listening comprehension, reading, writing, and speaking - are taught to students in an integrated manner. Reading - developing the skills and abilities of familiarization, skimming and careful reading; reading letters, correspondence and e-mail; reading authentic texts that reflect special materials; reading texts with special words and terms, scientific and professional literature, electronic sources and press materials; Writing - writing various correspondence, letters and special reports (memo CV, etc.); writing essays, statements, resumes, research work (articles, graduation qualification works); Listening comprehension - listening to authentic materials twice and understanding the main content, obtaining the necessary information and being able to express it; understanding daily news, reports, and the speech of film characters. Focusing knowledge and skills on the field The main goal of the professional-oriented stage: - Practical mastery of a foreign language in the professional field by types of speech; - Development of the student as a creative person;

	- Development of skills and abilities in translating literature in the field. 1. Reading: Work on a text (1200 - 1500 points) on various topics and fields of study per week during the academic year. 2. Writing: - writing greeting cards; - writing informal and formal letters; - writing a short summary of texts on various topics; - writing an essay of 200-250 words on various topics. 3. Listening comprehension: - listening to and understanding complex authentic speech in familiar and unfamiliar contexts, including radio, internet and television programs and interviews broadcast on them. 4. Speaking: General topics - about myself, about my family, work day, hobbies, spending free time, everyday life, etc.; Social topics - household issues, personal and professional psychology and ethics, environmental protection, global problems; Socio-cultural topics - cultural differences in scientific and industry-related situations, the world and the countries whose languages are being studied, their cultural and social characteristics, a foreign language and its role; Educational topics - the education system, continuing education, leading universities in the world, strategies for writing, reading, studying and presenting lectures, scientific articles, theses; Topics related to the Internet and information technologies - world and domestic scientific and technical news, achievements, discoveries and inventions, use of Internet networks, the latest technologies; Topics related to the field of specialization - industry trends, current topics, document management, professional ethics, negotiations, scientific and practical achievements in the field of specialization, innovative ideas and innovations, leading scientists in the field and their role in science. Learning outcomes (Results): Direction of knowledge and skills to the field; The main goal of the professionally oriented stage: - Practical acquisition of a foreign language in the professional field by types of speech; - development of the student as a creative person; - development of skills and abilities in translating literature in the field.

	When organizing, conducting practical exercises and assessing students' language acquisition, internationally recognized criteria for language acquisition are used: 1. 1. Listening comprehension competence: B2 level - understands long speech given in lectures or on television, more complex speech on familiar topics, understands the main idea of the topics being discussed while listening to and watching news broadcasts on TV and radio, and understands the content of films shown in a literary language. 2. Reading competency: B2 level - should be able to read and understand articles on current topics, and understand the content of modern prose works. This is because when reading a work, the student is expected to focus on the main idea, not on its literal translation. 3. Writing competence: B2 level - the student should be able to provide information on topics of interest to him/her and express his/her opinions on them in writing, clearly express his/her views on the topic, negative or positive aspects in writing 4. Speaking (dialogue, monologue) competence: B2 level (dialogue) - the student should be able to communicate freely with native speakers, actively participate in discussions on familiar topics, as well as interview native speakers and, in turn, answer their questions. Monologue - the student should be able to compose clear and detailed sentences on topics of interest to him/her, describe events and objects related to relevant topics.
Course content (topics)	I. I. Main part (Practical training) 1-st semester Lesson-1: Text: About myself, New words and word combinations; Doing exercises; Lesson-2: Discussion: Talking about yourself. Text: My biography; Doing exercises; Lesson-3: Text: My daily life... Grammar material: Prepositions of time; Text: My working day; Lesson-4: Text: My day off; New words and word combinations; Doing exercises; Lesson-5: Text: What's hobby? New words and word combinations; Doing exercises; Lesson-6: Text: Sport is very important in our life; New words and word combinations; Doing exercises; Lesson-7: Text: Holidays; New words and word combinations; Doing exercises; Lesson-8: Text: Shopping; Text: Shopping at the supermarket; New words and word combinations; Doing exercises; Lesson-9: Text: Travelling. Grammar material: The Sentence; New words and word combinations; Doing exercises; Lesson-10: Text: What is your specialty? New words and word

	combinations; Doing exercises; Lesson-11: Text: My future profession; Grammar material: The Future Indefinite Tense; New words and word combinations; Doing exercises; Lesson-12: Text: Choosing a Career; New words and word combinations; Doing exercises; Lesson-13: Text: Jobs and Professions; I want to be a doctor; Grammar material: to be fe'li; New words and word combinations; Doing exercises; Lesson-14: Text: Ecology; Grammar material: Adjectives and Adverbs; New words and word combinations; Doing exercises; Lesson-15: Text: Five of the world's biggest environmental problems; New words and word combinations; Doing exercises; Lesson-16: Text: Global problems of today; Writing essay; What can common people do to protect nature? New words and word combinations; Doing exercises; Lesson-17: Text: Science and technology in foreign countries; New words and word combinations; Doing exercises; Lesson-18: Text: Development of science and technology; New words and word combinations; Doing exercises; Lesson-19: Text: English speaking countries; New words and word combinations; Doing exercises; Lesson-20: Text: London; New words and word combinations; Doing exercises; Lesson-21: Text: Why do we learn the English language? New words and word combinations; Doing exercises; Lesson-22: Text: The Higher Education in English speaking countries; New words and word combinations; Doing exercises; Lesson-23: Text: Inventions and inventors; New words and word combinations; Doing exercises; Lesson-24: Text: Famous inventions and inventors; New words and word combinations; Doing exercises; 2-nd semester Lesson 1: Text: What do you know about energy? New words and word combinations; Doing exercises; Lesson 2: Text: Electricity. Text: Electric power; New words and word combinations; Doing exercises; Lesson 3: Text: Some facts about atoms and molecules; New words and word combinations; Doing exercises; Lesson 4: Text: What is radio communication? New words and word combinations; Doing exercises; Lesson 4: Text: What is radio communication? New words and word combinations; Doing exercises; Lesson 5: Text: Electricity and electronics; New words and word combinations; Doing exercises; Lesson 6: Text: Radio and TV Today; New words and word combinations; Doing exercises; Lesson 7: Text: Telegraph; Text: Telescope Text: Telephone; New words and word combinations; Doing exercises; Lesson 8: Text: History of Television; New words and word combinations; Doing exercises; Lesson 9: Text: Physics; New words and word combinations; Doing

	exercises; Lesson 10: Text: Famous personalities of the specialty: J.C. Maxwell; New words and word combinations; Doing exercises; Lesson 11: Text: Computer; New words and word combinations; Doing exercises; Lesson 12: Text: Internet Text: Internet in our life; New words and word combinations; Doing exercises; Lesson 13: A new microcomputer; New words and word combinations; Doing exercises; Lesson 14: Solar energy; New words and word combinations; Doing exercises; Lesson 15: Text: What is a laser? New words and word combinations; Doing exercises; Lesson 16: Text: Batteries; New words and word combinations; Doing exercises; Lesson 17: Text: The discovery of X-rays; New words and word combinations; Doing exercises; Lesson 18: Text: Nontraditional and renewable energy sources; New words and word combinations; Doing exercises; Lesson 20: Text: What is nuclear energy? New words and word combinations; Doing exercises; Lesson 21: Text: Optical technology; New words and word combinations; Doing exercises; Lesson 22: Text: Electrical units of measurement; New words and word combinations; Doing exercises; Lesson 23: Text: Massachusetts Institute of Technology; New words and word combinations; Doing exercises; Lesson 24: Text: Famous people: Isaac Newton, Alfred Nobel; New words and word combinations; Doing exercises; III. Instructions and recommendations for practical training The teacher's preparation for a practical training begins with the study of 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 training, the amount of work that each student must perform. Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training. In practical classes, emphasis is placed on developing students' speech (reading, writing, listening comprehension, speaking), language (lexical, grammatical), socio-cultural and pragmatic competencies in accordance with the requirements of the State Standard of the Republic of Uzbekistan; Also, attention is paid to developing oral and written presentation skills and qualifications on topics related to scientific, professional and everyday activities, introducing universal and national values, instilling a sense of intercultural tolerance and interethnic solidarity, and teaching terms and concepts used in scientific and professional activities; The purpose of practical classes is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

	IV. Independent learning 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. Independent study for recommended topics: 1. Reading to understand the general content of foreign language materials, obtain some information, understand details and determine the direction (signs, indicators, etc.); 2. Writing special formal and informal letters; 3. Writing an essay that is correctly organized in form and content; 4. Preparing lectures; 5. Preparing scientific articles that are sufficiently grammatically correct in content and in an appropriate style; 6. Writing proposals, conclusions, annotations and theses; 7. Being able to write graduation theses in their fields, if necessary;
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	50 points	System tasks	40 points (divided by the number of tasks)	30 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	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: - Scholastic Children's Dictionary. Library of Congress Cataloging-in-Publication Data. Updating edition, June 2002. New York. - Scholastic Kid's Almanac. For the 21st Century. Printed in the USA. July 23, 1999.				

3. The World Book Encyclopedia. A Volume1, Chicago, London.
4. Mustafoqulova H.A. – English-A collection of texts and exercises for students of the 3rd level of English language, Textbook, 2020.
5. Mustafoqulova H.A. – English for energetics - For energy specialists in the English language. Textbook, Tashkent - 2022.
6. Mustafoqulova H.A. – Practical English for energetics - For energy specialists in the English language. Textbook - 2022.
7. Mustafoqulova H.A. – English for radioelectronic devices and systems. A collection of texts and exercises for students of the 1st-2nd level of English language. Textbook - 2023.
8. Mustafoqulova H.A. – Professional English for energetics. Textbook for students of the 1st-2nd level of the Energy Department in English. 2024.
9. Mustafoqulova H.A. – Practical English for energetics – Workbook – Practical English for energetics – Workbook for energy specialists. Textbook - 2022.
10. Kurashvili E.I. "English language for students and physicists" / E.I. Kurashvili. - M.: Astrel, 2001.
11. Sikorskaya N.P. "English language for physicists" / N.P. Sikorskaya. - Minsk: Izd-vo BGU, 1981.
12. Men and women in Science. – The World Book Encyclopedia of Science. Volume 8. – Chicago. World Book, Inc. – 1991.
13. Physics today. – The World Book Encyclopedia of Science. Volume 2. – Chicago. – World Book, Inc. – 1990.
14. Boldak I.A., Alantseva T.I., Boyarchuk O.E., Gilyova O.V. - "Mir Fiziki - Physics World" - Posobiye. GrGU, Belarus, Grodno. - 2008.
15. Lawrence, Williams. Space. Last Frontiers for Mankind. - New York. Marshall Cavendish. - 1990.
17. 16. Kubarkov G. L., Tymoshuk B. A. Sbornik novykh tem sovremennogo angliyskogoazyka. - Rostov-on-Don OOO. "Udacha", 2007. Starkov A. P. English for 9th form. S P, 1999.
18. "Briefing papers for student" New York 2001.
19. Barhard J. The American Experience in Education. New York, 1975.
20. The World Book Encyclopedia. U-V Volume 20, Chicago, London, Sydney, Toronto 1993.
22. Dubrovskaya S.G. I second "Angliyskiyzyak dlya inzhenerov spetsialnostey vuzov" - M. Visshaya school, 1985.
23. Ivanova K. "English for students of electrical engineering". L.: 1983.
24. Makeyeva B.M. "English language" (dlya neyazikovikov vuzov). M. Visshaya school, 1988.
25. Novitskaya T.M. Kuchin N.D. Practical grammar of the English language M. Visshaya school, 1983.
- Christopher Morris, Jonny Prather. World English. New York.: 1997.

Additional literature:

1. Alovitdinova H., Radjabova D. and b. English for ESL and ESP learners. T.: TMU, 2012.
2. Ishmuhamedov R. Abduqodirov A. Pardayev A. Innovative technologies in education (practical recommendations for teachers of educational institutions). T.: Iste'dod, 2008.
3. Kerr P., Jones C. Straightforward. Intermediate. Student's book 2nd edition. - Teacher's book. - Macmillan, 2007.
4. Scrivener J, Bingham C., Tennant A., Wassermann S. Straightforward. Intermediate. Student's book 2nd edition. - Teacher's book. - Macmillan, 2007.
6. Kirkham L., Iriskulov A., Rashidova F. A handbook for teachers of FL with reference to the CEFR. - Tashkent, 2013.
7. Salimova Laylo. "English for financiers". Tashkent – 1998.
12. Gadoyeva et al. "English" textbook – Tashkent – 2000.
13. Dusboyeva N. , Hamzayev A. "Methodical development for 1st year students of English". Jizzakh – 2005.
14. Norbekova S. "Methodical development for 2nd year students of English". Jizzakh – 2005.
15. Mustafayev B. "Methodical development for 3rd year students of English". Jizzakh – 2005.
16. Mustafokulova H.A., Em M.V. "Collection of texts and exercises for independent work of students" – Jizzakh – 2006.
17. Mustafoqulova H.A.- "English" – a textbook for students of the electroenergetics department. (Order of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan dated December 07, 2020 No. 648. Registration number-648-071);
18. Mustafoqulova H.A.- English for energetic. Textbook-2022. . (ISBN-9789-943-9044-1-5).
19. Mustafoqulova H.A. - English for radio electronics and radio electronic systems. Textbook – 2023. (ISBN-978-9910-730-23-8).
20. Mustafoqulova H.A., Xolboyeva F., Murodova U., Tursunpo'latov D. - English B1 - Student's self-study work. Study guide - 2022. (ISBN-978-9943-93-91-2-7).
21. Soliev E.M. "General English" - Study guide for students of the "Transport" faculty. (Order of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan No. 356 dated August 18, 2021. Registration number-356/7-147).
22. John & Liz Soars. Headway. Intermediate. Oxford University Press - 1999.
23. Adrian Tennant. Straightforward. Pre-Intermediate. Student's Book. 2-nd edition. Macmillan, 2007.

Information sources:

1. www.teachingenglish.org.uk
2. www.elgazette.com
3. www.learnenglish.org.uk

	Internet sources: 1. www.ziyonet.uz – national educational materials search site. 2. www.gov.uz – Government portal of the Republic of Uzbekistan. 3. www.google.com – international educational materials search site. 4. www.energystrategy.ru – information portal “Energy Policy and Strategy” 5. www.twirpx.com – international educational materials search site.

Name of subject	Physics (ECTS 10)
Subject/module code	FIZ11210
Science taught semester (s).	1 st and 2 nd semester
Responsible teacher	Mustafakulov Asror Akhmedovich, professor
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-300. Audience Training hours - 120. Lecture training hour – 60 Laboratory training hour – 30 Practical training hour – 30 Independent education -120 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching science - the main goal of teaching the "Physics" course is to form in students a culture of looking at phenomena and processes in nature from a scientific perspective, as well as to prove the objectivity and possibility of mastering physical laws based on theoretical and experimental materials. The task of science is to reveal the role and importance of science in human life and society by providing students with theoretical knowledge, practical skills, a methodological approach to financial phenomena and processes, and a scientific worldview. Learning outcomes: 1. Physics studies the essence of physical phenomena in nature and technology through fundamental concepts in physics 2. Calculates the balance of matter and heat in technological cycles 3. Able to analyze the determination of electrical conductivity and elastic modulus 4. Formulates studies on creating a physical model of nuclear reactions to solve problems such as calculating them and explains the difference between them
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Teaching and goals of physics. Fundamentals of kinematics. Topic 2: Dynamics of a material point. Forces in nature and their properties. Topic 3: Types of energy. Conservation laws in mechanics. Topic 4: Mechanical vibrations and mechanical waves. Topic 5: General properties of liquids and gases. Topic 6: Fundamentals of molecular kinetic theory. Topic 7: Fundamentals of thermodynamics. Topic 8: Electrostatic field and its properties. Topic 9: Work done by electrostatic field forces. Potential. Topic 10: Dielectrics and conductors in an electrostatic field. Topic 11: The laws of electric current. Topic 12: Electric current in various media. Topic 13: Electric current in metals and semiconductors. 14-Topic: Electric current in gases and in a vacuum. 15-Topic: Alternative energy sources. Topic 16: Electromagnetism. Magnetic field strength. Topic 17: Magnetic properties of substances. Topic 18: Types of magnets. Topic 19: Current-carrying conductors in a magnetic field. Topic 20: The phenomenon of electromagnetic induction. Topic 21: Mutual induction. Alternating current. Transformer. Topic 22: Electromagnetic oscillations and waves.

Topic 23: Laws of geometric optics.

Topic 24: The wave nature of light. Interference of light. Diffraction of light.

Topic 25 Dispersion and polarization of light.

Topic 26 Laws of thermal radiation. Quantum nature of light. Elements of quantum optics.

Topic 27 Atomic structure. Corpuscular-wave dualism of microparticles.

Topic 28 Bohr theory of the hydrogen atom.

Topic 29 Structure and properties of the atomic nucleus.

Topic 30 Modern physical picture of the universe.

II. Instructions and recommendations for organizing laboratory exercises.

During laboratory sessions, students develop practical skills and competencies in measuring various parameters of physical processes, conducting experiments, performing calculations, and drawing tables and graphs. The recommended topics are selected based on available opportunities and conditions.

Recommended topics for laboratory work:

1. Determination of the acceleration due to gravity using the ring vibration method.
2. Determination of the acceleration of free fall using a physical pendulum.
3. Determination of the moment of inertia of a body using a dynamic method.
4. Determination of the moment of inertia of bodies using Maxwell's pendulum and verification of the law of conservation of energy.
5. Determination of the coefficient of internal friction of a liquid using the Stokes method.
6. Determination of the specific heat capacity of bodies by mixing
7. Study of gas laws. Dependence of gas pressure on volume at constant temperature. (Boyle-Mariotte law)
8. Determination of the resistance of a conductor using a constant current bridge
9. Study of the magnetic field of a straight conductor and a rotating ring
10. Study of measuring the magnetic field of an inductive coil without a magnetic core
11. Determination of the capacitance of a capacitor.
12. Determination of the focal length of a lens.
13. Determination of the wavelength of monochromatic light using a diffraction grating.
14. Checking the dependence of the photocell current on the angle of illumination and distance. Checking the dependence of the photocell current on illumination.
15. Study of Malus's law.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Fundamentals of kinematics

2. Fundamentals of dynamics
3. Rotary motion of solids.
4. Mechanical vibrations and waves.
5. Molecular physics and thermodynamics.
6. Electrostatics. Coulomb's law. Electric field strength and potential. Capacitance, capacitors.
7. Basic laws of direct current. Ohm's law for a part of a circuit and a complete circuit. Kirchhoff's rules. Work and power of current. Joule - Lens law
8. Magnetic field. Biot-Savart-Laplace law and its application to various conductors.
9. Current-carrying conductor in a magnetic field. Ampere force. Lorentz force.
10. Parameters of power devices. Magnetic flux. Electromagnetic induction. Inductance
11. Electromagnetic oscillations. Thomson's formula.
12. Laws of geometric optics. Photometry.
13. Interference of light. Diffraction of light. Polarization of light. Use of light energy.
14. Laws of thermal radiation. Quantum nature of light. Photoelectric effect.
15. Radioactivity. Mass defect. Binding energy of atomic nuclei.

IV. Independent learning 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. Fundamentals of Kinematics
2. Scientific discoveries of Uzbek thinkers - A.R. Beruni, Ibn Sina, M. Ulugbek, Abu Nasr Farobi, Al-Khwarizmi and others, their great contribution to world civilization.
3. Measurement of physical quantities. Types of errors.
4. Elements of kinematics.
5. Forces and conservation laws in nature
6. Kepler's laws.
7. The law of conservation and circulation of energy.
8. The motion of planets and satellites. Cosmic velocities.
9. Forces in nature. Frictional, elastic forces.
10. Dynamics of rotational motion of rigid bodies
11. Moment of inertia of bodies of various geometric shapes.
12. Mechanical vibrations and waves.
13. Pendulums and their types and applications.
14. Fluid and Gas Mechanics
15. Viscous Fluid Hydrodynamics.
16. Air Humidity. Saturated and Unsaturated Vapors.
17. Solids. Crystalline and Amorphous Bodies.
18. Surface Tension. Wetting and Non-Wetting. Capillary Phenomena.
19. Fundamentals of molecular physics and thermodynamics
20. Clapeyron-Mendeleev equation. Universal gas constant.
21. The basic equation of the molecular-kinetic theory of gases
22. Application of the first law of thermodynamics to isoprocesses.
23. Reversible and irreversible processes. Carnot cycle.
24. Van der Waals equation and isotherms. Internal energy of a real gas.
25. Migration phenomena. Diffusion, thermal conductivity and viscosity.
26. Energy. Electrostatics
27. The basic law of electrostatics - Coulomb's law.

	28. Piezoelectrics, ferroelectrics and their application in technology. 29. Capacitor and its types. 30. Structure and operating principles of modern power devices. 31. Laws of constant current 32. Types of electric heating devices and their applications. 33. Kirchhoff's rules. Connecting conductors. 34. Electrolysis. Faraday's laws for electrolysis. 35. Determining the electrochemical equivalent of copper. 36. Types of independent gas discharges and their applications. 37. Plasma. Properties and applications. 38. Thermoelectric phenomena. 39. Alternative energy sources and their production. 40. Electromagnetism 41. Application of the Biot-Savart-Laplace law to various current circuits. 42. Types of magnets. Diamagnets. Paramagnets. 43. The phenomenon of electromagnetic induction and Faraday's experiments. 44. Transformers and their types, principle of operation. 45. Ferromagnets and the phenomenon of hysteresis. 46. Resistance, capacitance and inductance in an alternating current circuit. 47. Alternating current power. Power factor. 48. Electromagnetic oscillation circuit. Thomson's formula. 49. Electrical measuring instruments and their structure. 50. Laws of geometric optics 51. Lenses and their types. Image formation in a lens. 52. The principle of holography and its application. 53. Eye-optical system. Spectral sensitivity of the eye. 54. Methods of observing light interference. Interferometers. 55. Fiber optic systems 56. Elements of quantum optics 57. X-rays and their applications. 58. Laws of blackbody radiation. 59. Einstein equation for the external photoelectric effect. 60. Areas of application of lasers. 61. Chemical effects of light, photosynthesis 62. Atomic and nuclear physics 63. Atomic structure. Bohr postulates. 64. Quantum numbers and their meaning. Spin quantum number. Pauli principle. 65. Beta decay. Beta decay spectrum. Neutrino. 66. The problem of controlling thermonuclear fusion reactions. 67. Atomic energy and work in Uzbekistan. 68. Radioactivity, its types. Radiation dose. 69. Types of fundamental interactions. Unified field theory. 70. Methods of recording and observing charged particles. 71. The origin and evolution of the universe. Theories of the big bang and inflation. 72. Modern physics and its achievements 73. Physics and the scientific and technological revolution. 74. Nanoelectronic materials. 75. Liquid crystals and their properties. 76. Modern energy devices
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. Douglas C. Giancoli, Physics: Principles with Applications, Prentice Hall; 6th edition January 17, 2004 USA. 2. Raymond A. Serway, John W. Physics for Scientists and Engineers with Modern Physics, Cengage Learning; 9. 2013, Brooks/cole 20 Channel Center Street Boston, MA 02210 USA. 3. Sultanov N. Fizika kursi. Darslik, T: Fan va Texnologiya, 2007 4. B.Izbosarov, I.Kamolov Molekulyar fizika va termodinamika asoslari , Toshkent, 2018 5. Orifjonov Elektromagnitizm.O`quv qo`llanma. T: Noshir, 2011 6. Izbosarov B.F., Kamolov I.R. Elektromagnitizm. Darslik, T: Iqtisod-moliya, 2006 7. Трофимова Т.И. Курс физики. Учебник -М.: «Академия », 2007 8. Детлаф А.А., Яворский Б.М., Курс физики.Учебник -М.: “Академия”, 2007 9. Qodirov O. Fizika kursi.(Mexanika, molekulyar fizika), 1- qism. T: Fan va texnologiya, 2005 10. Mamatqulov R., Tursunov A.A. Mamatqulov B.R. Termodinamika va statistik fizikadan masalalar,O`quv qo`llanma. T: O`zbekiston, 2003.</li> <li>11. Otaqulov B.O., Po`latov Yu.P.,Xalilov N.A., G`oziev Z.A. Fizika (Mexanika bo`limi),O`quv qo`llanma. Toshkent-2004 12. Qodirov O., Boydedayev A. Fizika kursi. Qism-3: Kvant fizikasi – T: O`zbekiston,2005</li> <li>13. Ismoilov M., Xabibullaev P.K., Xaliulin M. Fizika kursi. Darslik, T: O`zbekiston, 2000 14. Abdumalikov A.A., Sattorov H.M. Mexanika. O`quv qo`llanma. T: Donishmand ziyosi, 2020 15. Abduraxmonov K.P., Egamov O`. Fizika kursi. Darslik –Toshkent, 2010</li> <li>16. Nazarov O`Q. Umumiy fizika kursi 2-qism.Elekt va magnetizm. O`quv qo`llanma. T:O`zbekiston, 2002</li> <li>17. Tursunov I.G., Begmatova D.A. Fizika .O`quv –uslubiy qo`llanma. T: Tafakkur bo`stoni, 2018 18. Turg`unov T. Amaliy fizika. Darslik. T: O`zbekiston, 2003 19. Toshxonova J.A., O`lmasova M.H., Ismoilov I., Rizayev T., Maxmudova X.M. Fizikadan praktikum (Mexanika va molecular fizika). T:O`zbekiston faylasuflari milliy nashriyoti.2006 20. Toshxonova J.A., O`lmasova M.H., Ismoilov I., Rizayev T., Maxmudova X.M. Fizikadan praktikum. (optika) T:O`zbekiston faylasuflari milliy nashriyoti.2006 yil 31-b.				

21. Izbosarov B.F., Kamolov I.R. Umumiy fizikadan laboratoriya ishlari, T: Voris, 2007
22. Otaqozziyev B., Po'latov Yu. va b. Fizika. Mexanika bo'limi, Toshkent, 2004
23. Mustafakulov A.A., Eshbekova S.O., Jo'rayeva N.M. va b. Umumiy fizikadan amaliy mashg'ulotlar uchun o'quv qo'llanma. Innovatsion rivojlanish nashryot-matbaa uyi, 2019 yil-248b.
24. Mustafakulov A.A., Jo'rayeva N.M., Axmadjonova U.T. Fizikadan laboratoriya ishlari. O'quv qo'llanma. 2022
25. Маматкулов Б.Х. Оптика. Учебное пособие: Джизак «SANGZOR - PRINT» 2021г. 109стр
26. Маматкулов Б.Х. Курс физики (часть вторая). Учебник. Издательство «SANGZOR - PRINT», 2022г, 492стр..
27. Xayriddinov B., Jo'rayev Sh. Molekulyar fizika, Toshkent, 2013
28. Axmadjonov O. Fizika kursi. Darslik, 1-3 q.-T., "O'qituvchi", 1999
29. Kamolov J., Ismoilov I. va boshqalar Elektr va magnitizm. Elektr va magnitizm. O'quv qo'llama, Iqtisod-Moliya, 2007.
30. Volkenshteyn V.S. Umumiy fizika kursidan masalalar to'plami. T.: O'qituvchi, 1996
31. Chertov A., Vorobev A. Fizikadan masalalar to'plami. Darslik-T.: O'zbekiston, 1997
32. Begmatova D.A., Abdullayev R.M. Fizika. O'quv –uslubiy qo'llanma. T: Tafakkur avlodi, 2020.
33. Polvonov S., Bozorov E., Kanolov Z. Atom yadrosi va elementar zarrachalar fizikasi. O'quv qo'llanma. T: Go to print, 2020

Additional literatures

34. Mirziyoyev Sh.M. 2019 — 2030-yillar davrida O'zbekiston Respublikasining "yashil" iqtisodiyotga o'tish strategiyasini tasdiqlash to'g'risidagi O'zbekiston Respublikasi Prezidentining qarori, 04.10.2019 yildagi PQ-4477-son.
35. Mirziyoyev Sh.M. Tanqidiy tahlil, qat'iy tartib-intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidasi bo'lishi kerak. O'zbekiston Respublikasi Vazirlar Mahkamasining 2016 yil yakunlari va 2017 yil istiqbollari bag'ishlangan majlisidagi O'zbekiston Respublikasi Prezidentining nutqi. // "Xalq so'zi" gazetasi. 2017 y., 16 yanvar, №11.
36. O'zbekiston Respublikasi Konstitutsiyasi. - T.: O'zbekiston, 2017. - 46 b.
37. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. - T.: 2017 yil 7 fevral, PF-4947-sonli Farmoni.
38. Mirtadjieva K.T., Axunov T.A., Karabayeva M.A. Mexanika va molekulyar fizika. O'quv qo'llanma.-T: , Go To Print, 2020
39. Abdumalikov A.A. Elektrodinamika. Darslik-T.: Cho'lpon, 2011
40. Yusupov D.B., Kamolxo'jaev Sh.M., Gaibov A.G., Uzoqov A.A. Fizika fanidan laboratoriya ishlari uchun uslubiy ko'rsatma. - T: ToshDTU, 2015
41. Polvonov S.R., Daliyev X.S., Bozorov E.X., Palvanova G.S. Umumiy fizikadan masalalar to'plami. - T: Ijod- Pres, 2019
42. Yuldashev U., Sultonov M.U. Neytron va yadro fizikasi masalalari. O'quv qo'llanma. - T: Lesson press, 2021
43. Sodiqova Sh., Otajonov Sh., Kurbanov M. Lazerlar va ularning amaliyotdagi o'rni. O'quv qo'llanma. Toshkent-2020
44. Yuldashev B.S., Polvonov S.R., Bozorov E.X. Amaliy yadro fizikasi. Darslik.-T: Donishmand ziyosi, 2020
45. Teshaboyev A.T. Nanozarrachalar fizikasi, kimyosi va texnologiyalari. O'quv qo'llanma. T: Tafakkur bo'stoni, 2014

	46. Normuradov M.T., Umirzaqov B.E., Tashatov A.Q. Nanotexnologiya asoslari. O`quv qo`llanma. T: NIF MSh, 2020 47. Qosimov A., Jo'raqulov X., Safarov A. Fizika kursi. Mexanika 1-qism. O'zbekiston, Toshkent, 1994 48. Mo'minov A.E., Yuldashev U., Mustafaqulov A. Umumiy fizikadan laboratoriya ishlarini bajarish bo'yicha o`quv qo`llanma. Jizzax 2003 49. Mustafakulov A.A. va b. "Elektrotexnika materiallari". "Turon-Iqbol" nashryoti, Toshkent-2015. 50. Sattarov S.A., Mustafakulov A.A. va b. "Alternativ energiya manbalari", "Elektronika va asbobsozlik (elektronika sanoatida) bakalavriat ta'lim yunalishi talabalari uchun darslik, JiPI nashryoti, 233 b. 51. Jo'rayeva N.M., Axmadjonova U.T. Fizikadan laboratoriya ishlari uchun uslubiy qo`llanma(1-qism). 2023 yil 52. Abduraxmonov A. Mexanika va molekulyar fizika. Darslik. "JizPI tipografiyasi", Jizzax 2023 yil. 53. Qulboyev Z., O'rinov Sh. Mexanika va molekulyar fizika. Darslik. "JizPI tipografiyasi", Jizzax 2023 yil. 54. Raximov O., Xalilov O. Qurilishda fizika. O'quv qo'llanma "JizPI tipografiyasi", Jizzax 2023 yil. 55. Axmedov E., Abduraxmonov A. Elektr va magnitezm. Darslik. "JizPI tipografiyasi", Jizzax 2023 yil. Internet resources: 1. www.ziynet.uz – national educational materials search site. 2. www.gov.uz – Government portal of the Republic of Uzbekistan. 3. www.google.com – international educational materials search site. 4. www.energystrategy.ru – Information portal "Energy Policy and Strategy" 5. www.twirpx.com – international educational materials search site.

Name of subject	Higher mathematics (ECTS 14)
Subject/module code	OM112314
Science taught semester (s).	1 st /2 nd /3 rd semestr
Responsible teacher	Mamatov Jahongir Khamraqulovich, assistant teacher
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent learning)	Total hours - 420 . Audience Training hours - 168. Lecture training hours - 72 Practical training hours - 96 Independent learning -252 hours
ECTS	14
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop mathematical thinking in students, to acquire sufficient mathematical knowledge to solve theoretical and practical problems of research in the production process, including energy, to use them and to form skills and competencies to apply them. In addition, it is to provide students with solid fundamental knowledge, to teach them to translate the acquired knowledge into the mathematical "language" of modern practical problems, that is, to build mathematical models and make reasonable decisions by drawing conclusions based on their analysis. The main task of science is to fully and popularly explain to students (taking into account their level of knowledge) the essence of mathematical methods and their participation in modern computer programs using working educational documents compiled on the basis of the program in agreement with related and specialized departments. The task of the subject is to develop logical thinking and increase the level of mathematical knowledge in students, to be able to apply the acquired knowledge to solve practical problems, including energy-related problems, to improve fundamental skills in mathematical modeling of practical problems, and to independently increase the effectiveness of using modern literature and information technologies. Learning outcomes: 1. Students will have an idea of the fact that mathematics is a unique and special way of knowing the world, the generality of its concepts and hypotheses. 2. Students will study in depth the elements of analytical geometry and linear algebra. 3. Students will have the skills to know the basic concepts and methods of mathematical analysis and use them. 4. Students will know the elements of differential and integral calculus and be able to apply them in practice.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Basic concepts about matrices. Types of matrices. Operations on matrices. Determinant of a square matrix. The second and third order determinants and their calculation. Properties of the determinant. Higher order determinants. Inverse matrix. Rank of the matrix. Topic 2: System of linear equations. Basic concepts. Solution of a system of linear equations. Kronecker-Capelli theorem. Solving a system of linear equations using the matrix method and Cramer's formulas. Solving a system of linear equations using the Jordan-Gauss method. Solving a system of arbitrary linear equations. System of linear homogeneous equations. Topic 3: Rectangular Cartesian coordinate system in the plane and in space. Distance between two points. Division of a section in a given ratio. Vectors. Linear operations on vectors. Projection of a vector on an axis.

Propagation of a vector by the unit vectors of the coordinate axes. The modulus of a vector. Direction cosines. Linear connection of vectors, basis. Vectors in the Cartesian coordinate system. Dot, cross and triple cross products of vectors and their properties. Some applications of dot, cross and triple cross products.

Topic 4: Line in the plane. Equations of a straight line in the plane. The location of two straight lines in the plane. The distance from a point to a straight line.

Topic 5: General equation of second-order curves in the plane. Circle. Ellipse. Hyperbola. Parabola.

Topic 6: Equations of a surface and a line in space. Equations of a plane. Mutual location of two planes in space. Conditions of parallelism and perpendicularity of two planes. The distance from a point to a plane. Equations of a straight line in space. The mutual location of two straight lines in space. Basic problems between a straight line and a plane in space. The distance from a point to a straight line.

Topic 7: Function of one variable. Methods of function definition. Basic characteristics of a function. Basic elementary functions. Inverse function. Composite function.

Topic 8: Sequences. Limit of a numerical sequence. Transition from inequality to limit. Limit of a bounded monotonic sequence. The number e . Limit of a function. One-sided limits. Infinitely large and infinitely small functions.

Topic 9: Basic theorems on limits. First and second remarkable limits. Continuity of a function at a point and on an interval. Points of discontinuity of a function and their types. Theorems on continuous functions. Properties of a function that is continuous at an intersection.

Topic 10: Derivative of a function. Geometric and mechanical meaning of the derivative. The normal and differential equations of a function at a given point on the graph of a function. Differentiability of a function. Derivatives of addition, subtraction, multiplication, and division. Derivatives of composite and inverse functions. Derivatives of basic elementary functions. Differentiation of functions given in implicit and parametric forms. Differential of a function. Geometric and mechanical meanings of the differential of a function. Applications of the differential of a function to approximate calculus. Higher-order derivatives and differentials.

Topic 11: Basic theorems of differential calculus: Rolle, Cauchy and Lagrange theorems. L'Hopital's rule for solving uncertainties.

Topic 12: Monotonicity conditions of a function. Extremum of a function, necessary and sufficient conditions for the existence of an extremum. Finding the largest and smallest values of a continuous function on the section. Convexity, concavity and inflection points of the graph of a function. Asymptotes of the graph of a function. General scheme and construction of a graph for checking a function. Application of differential calculus in practical problems. Taylor's formula for the residual solution in the Lagrange form. Expansion of functions according to the Taylor and Maclaurin formulas.

Topic 13: Elementary function, indefinite integral and their geometric interpretations. Properties of indefinite integral. Integration methods: direct integration, integration by change of variable, integration by parts. Table of basic integrals.

Topic 14: Integer and fractional rational functions. Expansion of fractional rational functions into the simplest fractional-rational functions of the I, II, III, and IV types and their integration. Integration of rational functions.

Topic 15: Integral of trigonometric and irrational functions.

Topic 16: Integral sum and definite integral. Geometric and mechanical meanings of definite integral. Properties of definite integral.

Newton-Leibniz formula. Integral by change of variable in definite integral. Integral by parts of definite integral.

Topic 17: Improper integrals with infinite limits. Improper integrals of functions with discontinuities. Signs of approximation of improper integrals.

Topic 18: Applications of definite integral: calculating surfaces, arc lengths and volume of a body using definite integrals. Calculating the surface area of a surface formed by rotation. Mechanical applications of definite integral.

Topic 19: Function of several variables. Its domain and range. Limit, continuity of a function of two variables. Partial derivatives and total differential of a function. Differentiability of a function. Geometric meaning of the total differential. Tangent and normal plane equations of a surface. Application of the total differential in approximate calculations.

Topic 20: Higher-order partial derivatives and differentials. Differentiation of a composite function. Differentiation of implicit functions. Extrema of a function of two variables. The largest and smallest values of a function of two variables in a bounded closed domain. Conditional extrema.

Topic 21: Problems that can be reduced to differential equations. First-order differential equations. Cauchy problem. First-order differential equations with separated and separable variables. First-order homogeneous differential equations and equations reduced to homogeneous differential equations. First-order linear differential equation. Bernoulli equation. Total differential equation. Integrating multiplier.

Topic 22: Higher-order differential equations. Cauchy problem. Differential equations that can be reduced in order. Linear homogeneous higher-order differential equations. Linear homogeneous second-order differential equation with constant coefficients. Linear homogeneous higher-order differential equation with constant coefficients.

Topic 23: Nonhomogeneous second-order linear differential equation. Lagrange's method of variation of an arbitrary constant. Linear nonhomogeneous second-and higher-order differential equations with constant coefficients with special forms on the right-hand side.

Topic 24: Basic concepts. Normal system of differential equations. Methods for solving a normal system. Solving a system of linear first-order differential equations with constant coefficients. Applications of differential equations in the fields of electricity and energy.

Topic 25: Double integrals. Calculating double integrals in Cartesian and polar coordinates. Triple integrals. Calculating triple integrals. Applications of multiple integrals.

Topic 26: Curved integrals of the first kind. Calculating curved integrals of the first kind. Calculating curved integrals of the second kind. Connection between curved integrals of the first and second kind. Green's formula.

Topic 27: Surface integrals of the first kind. Calculating surface integrals of the first kind. Surface integrals of the second kind. Calculating surface integrals of the second kind. Stokes and Ostrograd-Gauss formulas.

Topic 28: Basic concepts. Geometric progression series. Necessary condition for convergence of a finite series. Harmonic series. Sufficient signs for convergence of finite series with constant sign. Signs for comparison of series. D'Alembert's sign. Cauchy's radical and integral signs. Series with alternating signs. Leibniz's sign. Numerical series with variable signs. Absolute and conditional convergence of numerical series.

Topic 29: Basic concepts. Power series. Convergence of a power

series. Abel's theorem. Radius and interval of convergence of a power series. Properties of a power series. Expansion of functions into power series. Taylor and Maclaurin series. Expansion of some elementary functions into Taylor (Maclaurin) series.

Topic 30: Basic concepts of field theory. Scalar field. Surface and level lines. Directional derivative. Gradient of a scalar field and its properties.

Topic 31: Field vector lines. Field flow. Field divergence. Ostrograd Gauss formula. Field circulation. Field rotor. Stokes formula. Solenoid field. Potential field. Harmonic field.

Topic 32: Subject of probability theory. Random events and their classes. Operations on events. Random event. Algebra of events. Relative frequency of an event. Stability of relative frequency. Statistical and classical definitions of probability. Elements of combinatorics.

Topic 33: Geometric definition of probability. Axiomatic definition of probability. Properties of probability. Conditional probability. Probability of a product of events. Discontinuity of events. Probability of a sum of events. Formula for total probability. Bayes' formula.

Topic 34: Repetition of trials. Bernoulli's formula. Local and integral theorems of Moivre-Laplace.

Topic 35: The concept of a random variable. The law of distribution of a random variable. The law of distribution of a discrete random variable. Distribution polygon. Distribution function and its properties. Distribution function of a discrete random variable. Distribution density and its properties.

Topic 36: Numerical characteristics of random variables. Mathematical expectation, variance and standard deviation of random variables. Binomial distribution law. Geometric distribution. Uniform distribution law. Exponential distribution law. Normal distribution law.

II. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with studying the initial documents (curriculum, thematic plan, etc.) and ends with drawing up a lesson plan. The teacher should have an idea of the goals and objectives of the practical training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of the practical training is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

III. Recommended practical topics:

1. Matrices. Operations on matrices. Second and third order determinants and their calculation. Calculating the determinant using its properties.

2. Calculating higher order determinants. Inverse matrix. Rank of matrix.

3. Systems of linear equations. Cramer and matrix methods for solving systems of linear equations.

4. Solving systems of linear equations using the Jordan-Gauss method. Solving systems of arbitrary linear equations. Systems of linear homogeneous equations

5. Cartesian coordinate system with right angles in the plane and in space. Distance between two points. Division of a section in a given ratio. Area of a triangle. Vectors. Linear operations on vectors

6. Dot, cross and triple cross products of vectors and their properties. Some applications of scalar, vector and mixed products.

7. Equations of a straight line in the plane. Location of two straight

lines in the plane. Distance from a point to a straight line.

8. Equations of a straight line in the plane. Location of two straight lines in the plane. Distance from a point to a straight line.

9. Second-order curves in the plane. Circle. Ellipse.

10. Hyperbola. Parabola.

11. Equations of a plane. The mutual location of two planes in space. Conditions for parallelism and perpendicularity of two planes. Distance from a point to a plane.

12. Equations of a straight line in space. The mutual location of two straight lines in space. Basic problems between a straight line and a plane in space. Distance from a point to a straight line.

13. Function. Domain of a function. Basic elementary functions.

14. Inverse function. Composite function.

15. Limit of a sequence of numbers. Converging sequences. The number e .

16. Limit of a function.

17. First and second remarkable limits. Continuity of a function.

18. Points of discontinuity of a function and their types. Properties of a function that is continuous at an intersection.

19. Derivative of a function. Geometric and mechanical meaning of the derivative. The normal equations of the function graph at a given point. Derivatives of addition, subtraction, multiplication and division. Derivatives of complex and inverse functions.

20. Differentiation of functions given in implicit and parametric forms. Differential of a function. Higher-order derivatives and differentials. Applications of the differential of a function to approximate calculations. Higher-order derivatives and differentials.

21. Basic theorems of differential calculus: Roll, Cauchy and Lagrange theorems.

22. L'Hospital's rule for revealing uncertainties.

23. Monotonicity conditions of a function. Extremum of a function, necessary and sufficient conditions for the existence of an extremum. Finding the largest and smallest values of a continuous function on an intersection.

24. Convexity, concavity and inflection points of a function graph. Asymptotes of the graph of a function. General scheme for checking a function and constructing a graph. Application of differential calculus in practical problems. Taylor formula for the residual solution in the Lagrange form. Expansion of functions according to the Taylor and Maclaurin formulas.

25. Elementary function and indefinite integral. Methods of integrating indefinite integrals.

26. Integrating rational functions.

27. Integrating trigonometric and irrational functions.

28. Calculation of definite integrals. Newton-Leibniz formula. Integrating by changing a variable in a definite integral. Integrating a definite integral by parts.

29. Improper integrals with infinite limits. Improper integrals of functions with discontinuities. Convergence signs of improper integrals.

30. Applications of the definite integral: calculating surfaces, arc lengths, and volume of a body using the definite integral. Calculating the surface area of a surface formed by rotation. Application of the definite integral in the energy and electrical fields.

31. Function of several variables. Its definition and range of values. Limit, continuity of a function of two variables. Partial derivatives and total differential of a function. Differentiability of a function. Tangent and normal equations of a surface. Application of total differential in approximate calculations.

32. Higher-order partial derivatives and differentials. Differentiation of a composite function. Differentiation of indeterminate functions. Extrema of a function of two variables. The largest and smallest values of a function of two variables in a bounded closed domain. Conditional extrema.

33. First-order differential equations. Cauchy problem. First-order differential equations with separated and separable variables. Homogeneous differential equations and differential equations that reduced to homogeneous differential equations. Linear differential equation. Bernoulli equation. Complete differential equation. Integrating multiplier.

34. Higher-order differential equations. Cauchy problem. Differential equations that can be reduced to a lower order. Linear homogeneous higher-order differential equations. Second-order linear homogeneous differential equation with constant coefficients. Higher-order linear homogeneous differential equation with constant coefficients.

35. Nonhomogeneous second-order linear differential equation. Lagrange's method of variation of an arbitrary constant. Linear nonhomogeneous second- and higher-order differential equations with constant coefficients, the right-hand side of which is in a special form.

36. Normal system of differential equations. Methods for solving a normal system. Solving a system of first-order linear differential equations with constant coefficients. Applications of differential equations in the fields of electricity and energy.

37. Double integrals. Calculation of double integrals in Cartesian and polar coordinates. Triple integrals. Calculation of triple integrals. Applications of double integrals.

38. First-order linear integrals. Calculation of first-order linear integrals. Second-order linear integrals. Connection between first- and second-order linear integrals. Green's formula.

39. Surface integrals of the first kind. Calculation of surface integrals of the first kind. Surface integrals of the second kind. Calculation of surface integrals of the second kind. Stokes and Ostrograd-Gauss formulas

40. Finite series. Necessary condition for convergence of a finite series. Sufficient signs for convergence of finite series with fixed sign. Signs for comparison of series. D'Alembert's sign. Cauchy's radical and integral signs. Series with alternating signs. Leibniz's sign. Finite series with variable signs. Absolute and conditional convergence of finite series.

41. Functional series. Power series. Convergence of a power series. Abel's theorem. Radius and interval of convergence of a power series. Properties of a power series. Expansion of functions into power series. Taylor and Maclaurin series. Expansion of some elementary functions into Taylor (Maclaurin) series.

42. Scalar field. Surface and level lines. Derivative with respect to direction. Gradient of a scalar field and its properties

43. Field vector lines. Field flow. Field divergence. Ostrograd-Gauss formula. Field circulation. Field rotor. Stokes formula. Solenoid field. Potential field. Harmonic field.

44. Operations on events. Random event. Algebra of events. Relative frequency of an event. Stability of relative frequency. Statistical and classical definitions of probability. Elements of combinatorics.

45. Geometric definition of probability. Properties of probability. Conditional probability. Probability of a product of events. Discontinuity of events. Probability of a sum of events. Formula of total probability. Bayes formula.

46. Repetition of trials. Bernoulli formula. Local and integral

theorems of Moivre-Laplace.

47. Random quantities. Law of distribution of random quantities. The distribution law of a discrete random variable. Distribution polygon. Distribution function and its properties. The distribution function of a discrete random variable. Distribution density and its properties.

48. Numerical characteristics of random variables. Expectation, variance and standard deviation of random variables. Binomial distribution law. Geometric distribution. Uniform distribution law. Exponential distribution law. Normal distribution law.

IV. Independent learning and independent work.

The competence of independent learning serves to promote independent self-development of students and increase the effectiveness of professional activity. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Independent learning for recommended topics:

1. Contributions of great scholars of Central Asia and mathematicians of Uzbekistan to the development of mathematics.

2. Matrices. Operations on matrices. Determinants. Properties of the determinant. Calculation of higher-order determinants. Inverse matrix. Matrix color. System of linear equations. Solving a system of nonlinear equations. Verification and solving a system of linear equations with $m-n$ unknowns. System of homogeneous linear equations.

3. Vectors. Linear operations on vectors. Vectors in the Cartesian coordinate system. Linear dependence and independence of vectors. Basis. Scalar, vector and mixed products of vectors and their properties. Some applications of scalar, vector and mixed products.

4. Line on the plane. Equations of a straight line on the plane. Location of two straight lines on the plane. Distance from a point to a straight line. General equations of second-order curves. Circle and ellipse. Hyperbola. Parabola. General equations of second-order surfaces. Sphere and ellipsoids. Hyperboloids. Conic surfaces. Paraboloids. Cylindrical surfaces. Construction problems solved using equations of a straight line.

5. Equations of a plane in space. Angle between two planes. Conditions for parallelism and perpendicularity of two planes. Distance from a point to a plane. Equations of a straight line in space. Basic problems of straight lines in space. Basic problems between a straight line and a plane in space. General equations of second-order surfaces. Sphere and ellipsoids. Hyperboloids. Conic surfaces. Paraboloids. Cylindrical surfaces. Equation of conic sections in polar coordinates.

6. Complex numbers. Operations on complex numbers. Writing a complex number in trigonometric and exponential form. Raising a complex number to a power and extracting its root. Moivre formulas.

7. Function. Methods of function assignment. Main characteristics of a function. Inverse function. Composite function. Graphs of basic elementary functions. Hyperbolic functions and their similarity properties with trigonometric functions.

8. Sequences. Limit of a sequence of numbers. Limit of an increasing sequence. The number e . Limit of a function. Basic theorems about limits. First and second remarkable limits. Points of discontinuity of a function and its types. Properties of a function continuous in a section.

9. Problems leading to the concept of a derivative. Definition of a derivative. Its mechanical and geometric meaning. The tangent equation and the normal equation of a curve. Derivatives of basic elementary functions. Derivatives of implicit and parametric functions. Higher-order derivatives. Geometric meaning of a second-order derivative. Higher-order derivatives of a given implicit function. Higher-order derivatives of a parametric function. Differential of a function. Geometric meaning of

the differential of a function. Application of the differential to approximate calculus. Higher-order differentials.

10. Basic theorems on differentiable functions. L'Hôpital's rule for revealing uncertainties. Checking a function using the first-order derivative. Convexity, concavity and inflection points of a function graph. Asymptotes of a function graph. Maximum and minimum values of a continuous function in a section. General scheme for checking and plotting a function completely. Taylor's formula. Energy problems related to finding the maximum and minimum of a function.

11. Indefinite integral. Initial function and indefinite integral. Properties of the indefinite integral. Basic table of indefinite integrals. Integrating by change of variable. Integrating by parts. Integrating rational functions. Integrating trigonometric functions. Integrating irrational functions. Euler's substitutions. Some recurrent formulas of integral calculus.

12. Definite integral. Geometric and physical meaning of the definite integral. Newton-Leibniz formula. Basic properties of the definite integral. Calculating the definite integral. Integrating by change of variable. Integrating by parts. Improper integrals. Signs of approximation of improper integrals. Geometric and physical applications of the definite integral. Approximating the definite integral. Right rectangle formula. Trapezoid formula. Simpson's formula.

13. Functions of several variables. Function of two variables. Its domain and range. Limit, continuity of a function of two variables. Partial derivatives and differentials of a function of several variables. Differentiability of a function and total differential. Geometric meaning of a total differential. Equations of a tangent plane and normal to a surface. Applications of the total differential in approximate calculations. Higher-order differentials. Derivative of a composite function. Total derivative. Derivative of an implicit function.

14. Extrema of a function in two variables. Necessary and sufficient conditions for an extremum. Conditional extremum. Maximum and minimum values of a function in a closed area.

15. Ordinary differential equations. Problems that can be reduced to differential equations. First-order differential equations. Cauchy problem. First-order differential equations with separated and separable variables. First-order homogeneous and homogeneous differential equations. First-order linear differential equation. Bernoulli equation. Complete differential equation. Integrating multiplier.

16. Higher-order differential equations. Cauchy problem. Differential equations that can be reduced in order. Linear homogeneous higher-order differential equations. Linear homogeneous second-order differential equation with constant coefficients. Linear homogeneous higher-order differential equation with constant coefficients. Nonhomogeneous second-order linear differential equation. Lagrange's method of variation of an arbitrary constant. Linear nonhomogeneous second-order differential equations with constant coefficients with a special form on the right-hand side.

17. System of differential equations. Normal system of differential equations. Methods for solving a normal system. Solving a system of linear first-order differential equations with constant coefficients. Application of differential equations in energy fields.

18. Multiple integrals. Double integrals. Calculation of double integrals in Cartesian and polar coordinate systems. Triple integrals. Calculation of triple integrals in Cartesian coordinates. Calculation of triple integrals in spherical and cylindrical coordinates. Applications of multiple integrals.

19. Curved integrals. First-order curved integrals. Calculation of first-order curved integrals. Some applications of first-order curved integrals.

	Second-order curved integrals. Calculation of second-order curved integrals. Ostrograd-Green's formula. Connection between first-order and second-order curved integrals. Some applications of second-order curved integrals. 20. Surface integrals. First-order surface integrals. Calculation of first-order surface integrals. Some applications of first-order surface integrals. Second-order surface integrals. Calculation of second-order surface integrals. Ostrograd-Gauss and Stokes formulas. Some applications of surface integrals of the second kind. 21. Numerical series. Basic concepts. Necessary condition for convergence of a numerical series. Harmonic series. Signs of comparison of series. Sufficient signs of convergence of numerical series with invariant sign. D'Alembert's sign. Cauchy's radical and integral signs. Generalized harmonic series. Numerical series with alternating signs. Leibniz's sign. Numerical series with changing signs. Absolute and conditional convergence of numerical series. 22. Functional series. Basic concepts. Power series. Convergence of a power series. Abel's theorem. Radius and interval of convergence of a power series. Properties of a power series. Expansion of functions into power series. Taylor and Maclaurin series. Expansion of some elementary functions into Taylor (Maclaurin) series. Some applications of power series. Approximate calculation of the value of a function. Approximate calculation of definite integrals. Approximate calculation of differential equations. 23. Elements of field theory. Basic concepts of field theory. Scalar field. Surface and surface lines. Derivative with respect to direction. Gradient of a scalar field and its properties. 24. Vector field. Vector lines of a field. Field flow. Field divergence. Ostrograd-Gauss formula. Field circulation. Field rotor. Stokes formula. Solenoid field. Potential field. Harmonic field. 25. Subject of probability theory. Random events. Random events and their classes. Operations on events. Random event. Algebra of events. Relative frequency of an event. Stability of relative frequency. Statistical and classical definitions of probability. Elements of combinatorics. Geometric definition of probability. Axiomatic definition of probability. Properties of probability. Conditional probability. Probability of a product of events. Discontinuity of events. Probability of the sum of events. Complete probability formula. Bayes' formula. 26. Repetition of trials. Bernoulli's formula. Local and integral theorems of Moivre-Laplace. 27. Random variables. The concept of a random variable. The law of distribution of a random variable. The law of distribution of a discrete random variable. Distribution polygon. Distribution function and its properties. Distribution function of a discrete random variable. Distribution density and its properties. Numerical characteristics of random variables. Expectation, variance and standard deviation of random variables. Binomial distribution law. Geometric distribution. Law of uniform distribution. Law of exponential distribution. Law of normal distribution. Law of uniform distribution. Law of exponential distribution. Law of normal distribution.
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		

		<table><tr><td rowspan="2">Midterm assessment</td><td rowspan="2">20 points</td><td>Supervision: Written work</td><td>10 points</td><td rowspan="2">12 points</td></tr><tr><td>System tasks</td><td>10 points (divided by the number of tasks)</td></tr><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* 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.</td></tr></table>	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.				
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Recommended Literature	Main literatures: 1. Xurramov Sh.R. Oliy matematika. T.: “Tafakkur”, 1-jild, 2-jild, 2018. 2. Claudio Canuto, Anita Tabacco. Mathematical Analysis I, II. Sprinder-Verlag Italia, Milan 2008, 2010. 3. Д.Т. Писменный. Конспект лекций по высшей математике. Полный курс. М.: Айрис Пресс, 2009. 4. V.E.Gmurman, “ Ehtimollar nazariyasi va matematik statistika T., “O’qituvchi”, 1977 yil, 368 b. 5. Минорский П. Сборник задач по высшей математике. ФИЗМАТЛИТ 2010 6. Xurramov Sh.R. Oliy matematika. Misol va masalalar. Nazorat topshiriqlari. 1- qism, 2- qism, 3-qism. T: Fan va texnologiyalar, 2015. 7. Piskunov N.S. Differensialnoe i integralnoe ischisleniYa. I, II. Moskva Nauka 1985 yil. 8. U.A.Djonizoqov, R.R.Gadayev: Oliy matematika, 2-qism Toshkent 2024 yil. Additional literatures: 9. Shamsiyev R.N., Shamsiyev D.N., Pirmatov Sh.T. Oliy matematika. Darslik, 2 qism. Toshkent, “Fan va texnologiyalar” nashriyoti 2020. -324 б (нашрда). 10. J.Stewart. Calculus, Broks/Cole, Cengage Learning, 2012. 11. К.Н.Лунгу, Е.В.Макаров. Высшая математика. Руководство к решению задач. Ч.2 – М.: Физматлит, 2007. 12. Рябушко А.П., Жур Т.А. Высшая математика: теория и задачи: учеб. пособие. В 5 ч: 1ч., 2ч., 3ч. Минск «Вышэйшая школа» – 2016, 2018. 13. Д.В.Клетеник. Сборник задач по аналитической геометрии. Издательства «Наука». Москва 1975. 14. Габитов Р.Ф. Финансовая математика. Конспект лекций: учебное пособие. Казанский Федеральный университет институт экономики и финансов Казан -2013. 15. Linacre House, Jordan Hill. Engineering Mathematics. USA Oxford 2007. 16. Берёзкина Н.С., Минюк С.А., Наумович Е.А. Математика для инженеров: примеры и задачи. Белорусский государственный университет. Гродно-2009. 17. Липовцев Ю.В., Третьякова О.Н. Основы высшей математики для инженеров. Московский государственный университет. Москва «Вузовская книга»-2009. 18. K.F. Riley, M.P. Hobson and S. J. Bence. Mathematical Methods for Physics and Engineering. Cambridge University press. Cambridge-2006. 19. Usanov M.M., Ne’matov A.R., Rahimov B.SH. Analitik geometriya. Toshkent 2023 yil.																		

	19.С.С.Шарипов, К.С.Ахадова, Ш.С.Кузиев. Высшая математика.Тошкент, Лиссон пресс 2021. 20. Xusanov D. Shamsiddinov N.A. Berdiyrov A.Sh. Aniq va aniqmas integrallar. “Turon iqbol” Toshkent 2021. 21. S. Otaqulov. Chiziqli algebra asoslari va uning tadbirlari. Toshkent 2021. 22.Сборник индивидуальных заданий по высшей математике. Под общей редакцией. А.П.Рябушко. в 3 ч.–Минск. «Высшая школа». 2007. 23.Берман Г.Н. Сборник задач по курсу математического анализа. Москва 1985 г. Internet resources: 1. www.gov.uz – O’zbekiston Respublikasi hukumat portali. 2. www.lex.uz – O’zbekiston Respublikasi Qonun hujjatlari ma’lumotlari Milliy bazasi 3. www.tradingeconomiss.com – ekonomicheskije pokazateli 4. www.catback.ru - научные статьи и учебные материалы 5. www.ziyonet.uz; 6. www.bilim.uz; 7. www.forgottenbooks.com

Name of subject	The latest history of Uzbekistan (ECTS 4)
Subject/module code	O'EYT1104
Science taught semester (s).	1 st semester
Responsible teacher	Akhmedov Jalol Tursumuratovich, assistant.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120. Audience training hours - 60 Lecture training hour – 30 Laboratory training hour – 0 Practical training hour – 30 Independent education-60 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to show the essence of the fact that Uzbekistan is one of the regions that has made a great contribution to the development of world civilization, that the Uzbek people have a rich historical past and invaluable spiritual heritage, that the Republic of Uzbekistan has undergone significant changes and fundamental reforms during the years of independence, and that the place of history, which is the basis of spirituality in the life of society and social lifestyle, is a means of self-awareness for young students, as well as to convey the essence of the principles of the individual, citizen, man, society and state in the upbringing of a harmonious generation at a new stage of Uzbekistan's development. The task of the subject is to organize a historical excursion into the rich historical past, in particular, the Uzbek statehood, to reveal the essence of the history of the 20th century, full of contradictions and contradictions, to fully explain to students the complex socio-political and economic situation that arose in Uzbekistan on the eve of independence, as well as the essence of the reforms carried out in the fields of state administration, socio-economic, political, spiritual and other areas during the years of independence, to educate them in the spirit of loyalty and love for the Motherland, and to form national pride and honor in the youth of New Uzbekistan. Learning out comes: 1. The most recent history of Uzbekistan will study the history and prospects of society. 2. The essence of fundamental reforms in the Republic of Uzbekistan will be studied. 3. The student will gain an understanding of the important changes that have occurred in the Republic of Uzbekistan. 4. The student will gain an understanding of public administration in the Republic of Uzbekistan during the years of independence. 5. Will be able to analyze the socio-economic sphere in the Republic of Uzbekistan. 6. Will be able to explain the participation in political and spiritual processes in the Republic of Uzbekistan. 7. Will be able to analyze the events taking place in the world in the Republic of Uzbekistan. 8. Will be brought up in the spirit of loyalty and love for the Motherland, and national pride will be formed.
Course content (topics)	I.Main the oretical part (Lecture Sessions) Topic 1: Introduction. Subject, goals and objectives of the academic subject “The Latest History of Uzbekistan”, theoretical and

methodological principles.

Topic 2: Historical foundations of the ideas of independence in Uzbekistan.

Topic 3: Socio-political processes in Uzbekistan on the eve of independence.

Topic 4: Historical significance of the formation of the independent Republic of Uzbekistan. Uzbekistan's unique path to independence and development.

Topic 5: Formation of the foundations of democratic, civil society in Uzbekistan, implemented political reforms.

Topic 6: Economic reforms, formation of private ownership. Development of market relations in Uzbekistan.

Topic 7: Reforms in the social sphere in the Republic of Uzbekistan.

Topic 8: Spiritual and cultural development in Uzbekistan during the years of independence.

Topic 9: Reforms implemented in the field of education in the Republic of Uzbekistan.

Topic 10: Uzbekistan and the world community.

Topic 11: Reflection of changes taking place in the socio-political, economic and cultural life of New Uzbekistan in international ratings and indices.

Topic 12: Reforms being implemented in New Uzbekistan under the leadership and initiative of President Sh.M. Mirziyoyev.

Topic 13: Reforms being implemented in New Uzbekistan under the leadership and initiative of President Sh.M. Mirziyoyev.

Topic 14: The socio-political significance of building a people-oriented and humane state in New Uzbekistan.

Topic 15: The socio-political significance of building a people-oriented and humane state in New Uzbekistan.

II. There are no laboratory exercises.

III. Practical training instruction sandre commendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

Topic 1: Introduction. Subject, goals and objectives of the academic subject "The Latest History of Uzbekistan", theoretical and methodological principles.

Topic 2: Historical foundations of the ideas of independence in Uzbekistan.

Topic 3: Socio-political processes in Uzbekistan on the eve of independence.

Topic 4: Historical significance of the formation of the independent Republic of Uzbekistan. Uzbekistan's unique path to independence and development.

Topic 5: Formation of the foundations of democratic, civil society in Uzbekistan, implemented political reforms.

Topic 6: Economic reforms, formation of private ownership. Development of market relations in Uzbekistan.

	Topic 7: Reforms in the social sphere in the Republic of Uzbekistan. Topic 8: Spiritual and cultural development in Uzbekistan during the years of independence. Topic 9: Reforms implemented in the field of education in the Republic of Uzbekistan. Topic 10: Uzbekistan and the world community. Topic 11: Reflection of changes taking place in the socio-political, economic and cultural life of New Uzbekistan in international ratings and indices. Topic 12: Reforms being implemented in New Uzbekistan under the leadership and initiative of President Sh.M. Mirziyoyev. Topic 13: Reforms being implemented in New Uzbekistan under the leadership and initiative of President Sh.M. Mirziyoyev. Topic 14: The socio-political significance of building a people-oriented and humane state in New Uzbekistan. Topic 15: The socio-political significance of building a people-oriented and humane state in New Uzbekistan. IV. Independent learning 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. It is recommended that students write essays, abstracts, tests, glossaries, and presentations on topics that are being studied independently. Recommended topics for independent study: 1. The cultural revival (Renaissance) that took place in our country in the 9th-12th centuries. The contribution of great scholars to world civilization. 2. Jaloliddin Manguberdi - defender of the fatherland. 3. Amir Temur - a great statesman. 4. Mirzo Ulugbek - a statesman and a great scientist. 5. The role of the new enlighteners in the socio-spiritual life of the country (Munavvar Qori, Fitrat, Behbudiy, Avloniy, etc.). 6. The socio-political situation in Uzbekistan during the years of "perestroika". 7. The content and essence of the changes being implemented in the social sphere in Uzbekistan. 8. Reforms implemented in the system of state administration during the years of independence. 9. Spiritual changes being implemented in new Uzbekistan. 10. The activities of the mass media in the Republic of Uzbekistan. 11. Changes in agriculture and industry during the years of independence. 12. Creation of guarantees of human rights and freedoms in the new Uzbekistan. 13. Reflection of changes taking place in the socio-political, economic and cultural life of the new Uzbekistan in international ratings and indices. 14. Cooperation relations of Uzbekistan with international organizations. 15. The role of Uzbekistan in ensuring peace and stability in Central Asia.
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	18 points

				of tasks)	
			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.R.H.Murtazayeva O‘zbekistonda millatlararo munosabatlar va tolerantlik. Darslik. - Toshkent: Mumtoz so‘z.2019 y. 2.O‘zbekistonning eng yangi tarixi. R.H.Murtazayeva, A.A.Ermetov, A.A.Odilov va boshq. – Toshkent.2024 y. 3.O‘zbekiston tarixi. A.S.Sagdullayev umumiy tahriri ostida.1-jild.Darslik. – Toshkent: NIF MSH.2024 y. 4.B.J.Eshov, A.A.Odilov O‘zbekiston tarixi.2-jild.Darslik. – Toshkent: NIF MSH.2024 y. 5.К.Д.Саипова. Новейшая история Узбекистана (учебное пособие). – Ташкент: NIF MSH. 2024 г. Additional literature: 6. O‘zbekiston tarixi (1917-1991 yillar).2 tom.Mas’ul muharrirlar: R.Abdullaev, Q.Rajabov, M.Rahimov. Darslik.- Toshkent: O‘zbekiston, 2019. 7.O‘zbekiston tarixi.Mas’ul muharrir R.H.Murtazayeva.Darslik. – Toshkent, 2020. 8.D.T.To‘xtaboyeva.O‘zbekistonning eng yangi tarixi: ma’naviy yangilanish, madaniy taraqqiyot va ijtimoiy o‘zgarishlar.O‘quv qo‘llanma. - Toshkent, 2021. 9.N.Oblamurodov.F.Tolipov.O‘zbekistonning eng yangi tarixi.Darslik. – Toshkent: Iqtisod-moliya, 2022. 10.A.A.Insopov.O‘zbekistonda fuqarolik jamiyati institutlarini shakllanishi va rivojlanish tarixi.O‘quv qo‘llanma. – Toshkent: Universitet.2023. 11.O.Q.Alimardonov.O‘zbekistonning eng yangi tarixi: tashqi siyosatning ustuvor yo‘nalishlari (o‘quv qo‘llanma). - Toshkent, FAST SUPPORT AND RESULT, 2023. 12.Т.И.Дорошенко. Новейшая история Узбекистана (учебное пособие). – Ташкент: Metodist nashriyoti, 2023. 13.Д.М.Иноятова.Новейшая история Узбекистана (учебное пособие для вечерних отделений). - Tashkent: Metodist nashriyoti, 2023. Internet resources: 14.www.ziyounet.uz. 15.https://ziyouz.uz 16.https://e-tarix.uz 17.www.edu.uz. 18.https://president.uz 19.https://lex.uz				

	20. www.gov.uz . 21. www.google.uz .

Name of subject	Information technology in technical systems (ECTS 4)
Subject/module code	TTAT1304
Science taught semester (s).	3 rd semester
Responsible teacher	Burliyev Abdulla Ubaydullaevich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 120. Auditory training hours - 48. Lecture session hours – 24 Practical training - 12 Laboratory hours - 12 Independent education -72 hour
ECTS	4
Science goals and objectives / learning outcomes	The purpose of teaching the subject is to help students in the age of digital technology. modern information communication technologies application method and tools, computer modeling, principles of programming technologies from developing the skills to teach and apply them in practice consists of. The task of the subject is education directions according to applicable automated design systems using solving problems , modeling, design and product design working exit and knowledge of the essence of programming, and the scientific understanding of students in relation to them information and communication technologies through the formation of worldviews opportunities manifestation to grow. Learning outcomes: 1. Will gain skills in intelligent control systems and artificial intelligence, expert systems. 2. Will acquire skills in modern automated design systems and their application in technical fields . 4. Will acquire skills to work independently in graphic modeling programs and geoinformation system programs. 5. On the network reliability increase for backup , monitoring and other methods by hand takes ; 6. Information database , cloud technologies about to knowledge has will be ;
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) 1-topic. "Technical" in systems information technologies" science subject and tasks. "Technical" in systems information technologies" science subject and styles. Technical in systems information communication technologies (ICT) main functions and application in the field of information technology. ICT in Uzbekistan field in development main directions, current laws, Decrees of the President of the Republic of Uzbekistan and the Cabinet of Ministers decisions. In the republic computerization and ICT develop programs, tasks study. ICT technician in the directions implementation to grow principles, digital the economy develop for the purpose digital infrastructure modernization to do. Technical in systems management for modern application of technologies. Computer ethics. 2-topic. Intellectual management systems. Expert systems Intellectual systems purpose, functions and methodology. Expert

systems. Expert system structural part. Expert systems classification, structure structure.

3-topic. Modern automated design systems and them technician in the fields application.

Design processes and stages. In automated design used model and parameters classification. Automated design systems structure and types. Synthesis and analysis issues. Create analytical, parametric and numerical models based on a conceptual design and analysis.

4-topic. Mathematician modeling, numerical analysis methods in systems done increase. Accountable experiment.

Mathematica, Maple, Matlab, MathCAD programs in the example static and dynamic models done increase. System in the composition programming.

5-topic. Graphic modeling. Design in the process practical graphic programs from the possibilities use.

3D Max, CATIA, KOMPAS, Solid Works, AutoCAD, Parasolid, Solid Edge, CorelDraw practical programs in the example of graphic modeling.

6-topic. Imitation modeling.

Imitation models and their types. To the parameter based models in the system application. Proteus, Simulink, PCAD, T-Flex practical in programs imitation models create.

7-topic. Geoinformation systems.

Geoinformation systems classification, models features and Application method: Micro Main, Main Tenance, Premium, Geologia Surpoc, Arc GIS practical in programs modeling and design.

8-topic. Network information base. Cloudy technologies.

Databases and their models on the Internet. Clipper, Application of Oracle, MySQL systems in technical and technological processes. Cloudin technologies SaaS, PaaS and IaaS models.

9-topic. Information security in technical and technological processes to provide.

Bank in systems, in geosystems, electromechanical in systems, modern information protection in biosystems, monitoring systems methods current to, information protection to do tools and methods efficiency assessment, information protection to do software and technician Use of tools. Study of cryptographic methods of information security and them information safety in increasing application. Best Crypt, Pretty Good Privacy, InfoWatch CryptoStorage programs.

10- topic. Technical in systems network safety.

Information communication technologies safety provide software and hardware that enables the exchange and transmission of data for the purpose of installing, configuring, and testing networks, including hardware systems Perform a transfer. Prevent cyber attacks that affect system performance mechanisms for detecting and protecting against threats, and repelling attacks study. Comodo Firewall Pro, Avast Internet Security, AVG Internet Security, Outpost Firewall, Zone Alarm Free Firewall, Kerio Winroute Firewall from cross-network screen programs use.

11-topic. Modern programming technologies. To the object

object-oriented programming languages.

Modern programming technologies. Programming languages and systems, their usage and classification. Programming of languages main modules. Programming systems place, task technician issues in solution JavaScript, Java, Python, Ruby, PHP, C++, CSS, C#, Objective- C programming in systems software create applications learning styles.

12- topic. Basic constructs of the C++ programming language and features of its use in the system.

Program structure. C++ programming of the language main constructions, Features of their use. Operators, categories, procedures. Program Project structure. Cases and forms of program creation. Program structure parts. Various technician in the fields of information categories structure. Linear computational processes programs. Examples in technical systems linear programming application. Identifier, variables categories (types). Input and output of data, manipulation in the algorithmic language S++ as a row, format specifications and modifiers, standard librarytitle files .

II. Instructions and recommendations for organizing practical training.

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.

All practical work and exercises are done on computers. Students will be able to from EXM in the power supply system during execution use and EXM issues at solution according to skills they produce

Recommended topics for practical training:

1. Practical programs using engineering issues mathematician models create (Mathematica, Maple, Matlab, MathCAD).
2. Design in the process practical programs graphic from the possibilities use and visualization (3D Max, CATIA, COMPASS, Solid Works, AutoCAD, Parasolid, Solid Edge, CorelDraw).
3. Creating simulation models in practical programs (Proteus, Simulink, PCAD, T-Flex). Representing engineering problems and developing models in geoinformation systems.
4. Protection cryptographic from the methods use.
5. To the object directed programming technologies.
6. Logical programming technology.
7. Programming in systems applications create technology

III. Guidelines 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.

Suggested topics for laboratory exercises:

	1. CAD systems practical programs interface study and application. 2. Mathematics in solving engineering problems in CAD systems to the models calculation experiment and numerical perform the analysis increase. 3. Technical to objects relevant graphic models practical in programs to express, recycling and visualization. 4. Technical to objects imitation models create and analysis to grow. 5. Identify and mitigate cyber attacks that affect system 6. To the object directed programming in systems structural applications create. 7. Engineering in solving problems programming systems using graphics and multimedia from the possibilities use. 8. Internet on the network information base software system tools create using IV. Be careful . 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. Digital the economy in development information communication technologies place. 2. In Uzbekistan information communication field in development main directions, current laws, President of the Republic of Uzbekistan decrees and resolutions of the Cabinet of Ministers decisions. 3. Systematic and practical software of supply development trends. 4. The role of expert systems in management and their application 5. Intelligent control systems in robotics application prospects 6. Automated design systems in mechanics, energy, electronics, geology, mechanical engineering and other in the fields application. 7. Application of three-dimensional graphics capabilities in design technologies. 8. Geoinformation systems application problems. 9. Cybersecurity on the surface international documents and edge hand countries experience. 10. Information communication in systems information safety. 11. Non-standard modules create and them in the program application. 12. Web to program based practical systems.
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		

	<table><tr><td rowspan="2">Midterm assessment</td><td rowspan="2">20 points</td><td>Supervision: Written work</td><td>10 points</td><td rowspan="2">12 points</td></tr><tr><td>System tasks</td><td>10 points (divided by the number of tasks)</td></tr><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* 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.</td></tr></table>	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.				
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* 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. Kadirov M.M. «Axborot texnologiyalari» fanidan o‘quv qo‘llanma 1-qism,T.:«Sano-standart» nashriyoti, - 2018, 320 bet. 2. Kadirov M.M. Texnik tizimlarda axborot texnologiyalari 2-qism: darslikG’ M.M. Kadirov - Toshkent: «O‘zbekiston faylasuflari milliy jamiyati», Toshkent 2019, 306 bet. 3. R.A.Dadabayeva, Sh.T.Nasridinova, N.X. Shoaxmedova, L.T.Ibragimova, Sh.T.Ermatov. «Axborot-kommunikatsiya texnologiyalari va tizimlari» - T.:«Sano-standart» nashriyoti, - 2017, 552 bet. 4. Kenjabayev A.T., Ikromov M.M., Allanazarov A.Sh. «Axborot-kommunikatsiya texnologiyalari» o‘quv qo‘llanma. – Toshkent: «O‘zbekiston faylasuflari milliy jamiyati» nashriyoti, Toshkent 2017. Additional literature 5. Decree of the President of the Republic of Uzbekistan dated February 7, 2017 No. PF-4947- number "Uzbekistan" Republic further develop according toAction strategy about decree. 6. Nazirov Sh.A., Qobulov R.V., Bobojonov M.R., Raxmanov Q.S. C va C++ tili. Voris-nashriyot. Toshkent 2013. 488 b. 7. Kenneth C. Laudon, Jane. P. Laudon. Management Information Systems:Managing the Digital Firm, 13th Edition, Pearson Education, USA 2014.P 621. 8. Kunwoo Lee. Principles of CADG’CAMG’CAE: The Computer Aided Engineering Design Series. 5st Edition. Addison Wesley Longman, USA,2015. 9. Alex Allain. Jumping into CQQ. USA, 2014. p 340. 10. Azimdjanova M.T., Muradova M.T., Pazilov M.S., Informatika va axborot texnologiyalari o‘quv qo‘llanma – Toshkent: «O‘zbekiston faylasuflari milliy jamiyati» nashriyoti, Toshkent 2013, 176 bet. 11.M.Aripov, S. Dottoyev, M.Fayziyeva. o‘quv qo‘llanma – Toshkent: «O‘zbekiston faylasuflari milliy jamiyati» nashriyoti, Toshkent 2013,280 bet. 12. S.K. Ganiyev, M.M. Karimov, K.A. Tashev. Axborot xavfsizligi. – T.:“Fan va texnologiya”, 2017, 372 bet. Information sources 13. www.lex.uz – Uzbekistan Republic Law documents informationnational base. 14. www.ziynet.uz – Uzbekistan Republic education portal. .																	

Name of subject	Engineering and computer graphics (ECTS 4)
Subject/module code	MKG1204
Science taught semester (s).	2 nd semester
Responsible teacher	Gapparov Bekhzod Nematillaevich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 120 . Audience Training hours - 48. Lecture hours - 12 Practical hours - 36 Independent education - 72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject “Engineering and Computer Graphics” is to provide students with the knowledge required by the educational standards in accordance with the profile of the direction, to improve and develop thinking skills related to the logical analysis and generalization of spatial constructive-geometric structures, to visualize various three-dimensional objects in space and their relationships, to logically analyze and generalize spatial structures based on graphic models of space in the form of two-dimensional drawings on a plane. It is to acquaint students with modern graphic software tools, to train them to master the knowledge and skills of performing graphic primitives corresponding to the direction of the specialist, to edit them and create acceptable variants, to store the performed graphic information in memory and print it on paper, to the level required by the educational standards. The task of the subject is to master the methods of creating specific graphic models based on the central and orthogonal projection of space in "Engineering and Computer Graphics" and to acquire sufficient knowledge, skills and qualifications to independently solve positional and metric problems related to spatial objects and their relationships using these graphic models. It is to provide students with sufficient knowledge, skills and qualifications necessary for the automation of work such as designing two- and three-dimensional images of geometric objects in engineering and specialized disciplines, as well as creating models of technological processes. Learning outcomes: 1. To develop knowledge, skills and competencies in students to graphically represent complex details leading to a green economy. 2. To be able to analyze theoretical models and understand the main mechanisms. 3. To collect data relevant to graphically representing complex details leading to a green economy. 4. To be able to apply their empirical knowledge in the analyses being conducted. 5. To be able to express and defend their opinions justifying the use of graphic images for a green economy. 6. To be able to analyze production-related data on the use of graphic images for a green economy.

Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Introduction. Basic information about drawing. Drawing materials, tools and devices. Standards, drawing formats, basic notation, scales. Drawing tools and their use. Types of pencils and their preparation for work. Ruler. Triangles. Gotovalnya (set of drawing tools). Drawing circle. Drawing standards. Formats. Drawing format frame and main inscription. Line types. Scales. G. Monge method. Central projection method. Parallel projection method. Point coordinates. Symmetry of points and shapes. Basic properties of projection. Straight line. Position of a straight line in space. Topic 2: Straight lines in special situations. Traces of a straight line. Intersections of two straight lines. Constructing the actual length of a section in a general situation. Special cases of a straight line with respect to the planes of projections. Traces of a straight line. Mutual cases of two straight lines. Projections of the angle between intersecting straight lines. Methods of representing a plane in a diagram. Traces of a plane. Planes in a special situation. Properties of projecting planes. Perpendicularity of a straight line and a plane and mutual perpendicularity of two planes. Constructing traces of a plane given by a point or straight lines. Points lying on a plane. Parallelism of a straight line and a plane. Intersection of two planes. Topic 3: Geometric constructions in drawings. Drawing parallel straight lines. Drawing perpendicular straight lines. Dividing a straight line segment into equal parts. Dividing an angle into equal parts. Drawing a straight line. Selecting a point on a straight line. Determining the actual length of a straight line segment in an arbitrary position and the angles formed by its projection planes. The mutual location of two straight lines. Projecting an object onto projection planes. The concept of central and parallel projection. The plane of vertical projections (V) and its position in space. The plane of horizontal projections (H) and its position in space. Basic concepts of views and their mutual correspondence with the image of the object on the projection plane. The concepts of section and cut. Their different aspects. Requirements for the location of images in drawings. Topic 4: Views. Sections and cuts. Graphical designations of materials in sections and cuts. View. Local view. Main view. Additional view. Image positioning system. Section. Shear. Simple shearing of details. Local shear. Complex shear. Simple shears. Graphical designation of materials in drawings. Elements of extraction. Axonometric projections. Right-angle axonometric projections. Oblique axonometric projection. Creating axonometric projections. Axonometric projection of flat shapes. Axonometric projection of flat-sided objects. Axonometric projection of geometric shapes with rounded surfaces. Topic 5: Polygons. Representation of polygons on a plane. Intersection of polygons with a plane. Intersection of a polygon with a straight line. Construction of regular polygons. Polygons. Areas of application of polygons and a group of arising problems. Describing polygons using the method of G. Monge. Methods for constructing projections of polygons. Intersection of polygons with a plane. Intersection of a polygon with a straight line. Construction of regular polygons. Intersection of surfaces with projective planes. Drawing a tangent plane through an arbitrary point of a surface. Drawing a tangent plane through a given straight line. Constructing a projection of cylindrical surfaces. Constructing a projection of conical surfaces. Constructing a line of intersection of surfaces. The theorem on the

intersection of second-order surfaces. Surface of a polygon. Intersection of a polygon with a straight line.

Topic 6: Curves. Curves drawn using a circle. Ovals. Curves drawn using a ruler. Ellipse. Drawing technical drawings. Drawing flat shapes. Drawing geometric objects. Hatching light and shade.

Curves. Lekalo curves. Circular curves. Ellipse. Parabola. Hyperbola. Cyclic curves. Cycloid. Epicycloid. Hypocycloid. Classification of points on a plane curve. Second-order curves. Spatial curves and their changes in slope and norm. Drawing of plane shapes. Hatching of light and shade and shadows. Drawing of geometric bodies. Bolted connection. Stud connection. Screw and screw connections. Threaded connections with pipes. Pin and pin connections. Inch threads. Depiction and designation of threads in drawings. Thread termination, protrusion, chamfer. Details of threaded connections. Rules for drawing and reading assembly drawings of any complexity. Conventions and simplifications in assembly unit drawings. Simple structure of the scheme. Conventions and simplifications in assembly drawings.

II. Instructions and recommendations for practical training

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It consists in developing the ability to consciously apply it in educational and professional activities, and confidently form one's own point of view.

Recommended practice topics:

The following topics are recommended for practical training:

Topic 1: Introduction. Basic information about drawing. Drawing materials, tools and devices. Standards, drawing formats, basic notation, scales.

Topic 2: Engineering and computer graphics science and theoretical foundations of drawing. G. Monge method. Graph by point coordinates.

Topic 3: Straight line. Position of a straight line in space. Straight lines in a special situation. Traces of a straight line. Mutual positions of two straight lines.

Topic 4: Plane. Point and straight line on a plane. Main lines of a plane. Planes in a special situation. Intersection of a straight line and a plane. Perpendicularity of a straight line and a plane and mutual perpendicularity of two planes. Parallelism of a straight line and a plane. Mutual parallelism of two planes. Intersection of two planes.

Topic 5: Geometric constructions in drawings. Drawing parallel straight lines. Drawing perpendicular straight lines. Dividing a straight line section into equal parts. Dividing an angle into equal parts.

Topic 6: Projection drawing. Central and parallel projection. Projecting an object onto two mutually perpendicular planes.

Topic 7: Views, sections and cuts in drawings. Arrangement of images in drawings. Views. Sections and cuts. Graphical designations of materials in sections and cuts.

Topic 8: Axonometric projections. Rectangular axonometric projections. Rectangular isometric projection. Rectangular dimetric projection.

Topic 9: Polygons. Representation of polygons on a plane drawing. Intersection of polygons with a plane.

Topic 10: Intersection of a polygon with a straight line. Construction

of regular polygons.

Topic 11: Intersection of surfaces with a plane and a straight line. Intersection of surfaces with projecting planes.

Topic 12: Construction of surface projections. General information. Propagations of polygons. Construction of projections of cylindrical surfaces.

Topic 13: Connections used in solar panels.

Topic 14: Curves. Curves drawn using a circle. Ovals. Curves drawn using a template. Ellipse.

Topic 15: Drawing technical drawings. Drawing flat shapes. Drawing geometric bodies. Hatching light and shade.

Topic 16: Separable and non-separable joints. General information. Threads, their types and designation. Depiction and designation of threads in a drawing.

Topic 17: Fasteners, screws, studs, stud sockets, nuts, washers. Drawing threads. Drawing stud joints. Non-separable joints.

Topic 18: Creating and reading assembly drawings. Reading assembly drawings. Drawing assembly drawings into details.

III. Independent learning and independent work.

Recommended topics for independent learning:

1. Making traces of a plane in an arbitrary situation.
2. Determining the actual size of the distance from a point to a plane.
3. Drawing a plane perpendicular to a straight line from a point.
4. Drawing traces of a plane parallel to a given plane with a length of 20 mm.
5. Drawing projections of the intersection line of two given planes with a triangular plane and determining the “visible and invisible” parts.
6. Determining the actual size of the angle between two intersecting planes by the substitution method.
7. Determining the actual appearance of a plane by the rotation method.
8. Determining the intersection line of two polyhedral surfaces.
9. Determining the projections of the intersection line of surfaces with a plane in a general situation and its actual appearance. Performing the intersection line of surfaces by the method of auxiliary intersecting planes.
10. Constructing the intersection line of surfaces of revolution using the method of auxiliary cutting spheres.

The following independent works are performed in AutoCAD, KOMPAS or Corel Draw programs:

1. Constructing three images of the part based on a clear image of the part in engineering graphics.
2. Drawing a third view based on two views of the part in “projection drawing”, performing a section and an axonometric projection.
3. Drawing a third view based on two views of a complex part, performing a section and an oblique section.
4. Drawing drawings of bolted and studded joints.
5. Drawing a sketch drawing of mechanical engineering parts and performing a working drawing of the part based on it.
6. Drawing a working drawing of 3-4 parts in an assembly unit according to the direction, dividing them into details and performing an axonometric projection of one of them.

Note: Students are recommended to complete their homework assignments on a computer using AutoCAD, KOMPAS or Corel Draw programs, based on the instructions of the professor-teacher.

In addition, when organizing independent learning, it is recommended to use the following forms, taking into account the characteristics of a particular subject, and they are considered current control:

	1) preparing a synopsis (abstract, presentation) on topics. This method, which helps to thoroughly master the theoretical material, helps to attract more attention to the educational material. The student's synopsis simplifies the preparation for various control works and saves time. 2) working with automated systems of teaching and control. Recommended electronic resources, innovative lesson project samples, test tasks for self-control, etc. are used to prepare for various control works. 3) working with additional literature on the subject. For independent study, students use additional educational and scientific literature in addition to the recommended main literature on the topics given. In this case, the use of literature in Russian and foreign languages is encouraged. 4) Use of the INTERNET. The development of subject topics, finding INTERNET resources on the topic, working with them is encouraged with additional rating points in all types of control. • Studying subject chapters and topics in textbooks and manuals; • Mastering the lecture part on handouts; • Working on subject sections or topics in special literature; • Studying new techniques, processes and technologies that lead to a green economy; • Training sessions using active and problem-based learning methods; • Distance learning; To place practical training work, complete A4 or A3 formats with basic notes.
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. A.B.Muxitdinov. “Chizma geometriya va muhandislik grafikasi”. O‘quv qo‘llanma.–Jizzax: JizPI, 2021 yil, 145 b. 2. X.A.Aynaqulov. “Muhandislik va kompyuter grafikasi”. O‘quv qo‘llanma.–Jizzax; JizPI 2021 yil, 267 b. 3. F.B.O‘razaliyev. “Muhandislik va kompyuter grafikasi”. O‘quv qo‘llanma.–Jizzax; JizPI, 2022 yil, 188 b. 4. A.Y.Xatamov. “Muhandislik va kompyuter grafikasi”. O‘quv qo‘llanma.–Jizzax; JizPI, 2022 yil, 209 b.						

5. A.Y.Xatamov. “Muhandislik va kompyuter grafikasi” darslik.– Jizzax JizPI, 2022 yil, 320 b.
6. R.Xorunov. Chizma geometriya kursi. Texnika oliy o‘quv yurtlari uchun darslik.–T.: O‘qituvchi, 1997 y.
7. A.N.Valiyev. N.X.Gulomova. “Chizmachilik” (mashinasozlik). O‘quv qo‘llanma.–T.: O‘zbekiston xalq islom akademiyasi 2020 yil, 228 b.
8. A.N.Valiyev. “Perspektiva” darslik.–T.: Voris, 2012 yil, 325 b.
9. A.A.Karimov. “Chizma geometriya”. O‘quv qo‘llanma.–T.: Fan va texnologiya. 2017 yil, 208 b.
10. M.B.Shah, B.C.Rana. «Engineering Drawing», 2009. 568 pages
11. Elliot Gindis «Up and Running with AutoCAD® 2011 2D Drawing and Modeling», 2011. 511 pages.
12. U.T.Rixsiboyev, D.F.Kuchkarova, Ch.T.Shokirova, X.M.Rixsiboyeva. “Muhandislik va kompyuter grafikasi” darslik. –T.: Tafakkur qanoti. 2019 yil 383 b.
13. Sh.Murodov, L.Xakimov, A.Xolmurzayev, M.Jumayev, A.To‘xtayev. “Chizma geometriya”. O‘quv qo‘llanma, Iqtisod–moliya, 2006 yil, 241 b.
14. B.B. Qulnazarov. Chizmachilik va kompyuter grafikasi asoslari. O‘quv qo‘llanma. Samarqand, 2004.
15. J.Yodgorov. “Chizma geometriya”. darslik.–T.: TURON–IQBOL, 2007 yil, 232 bet.
16. A.A. Karimov. “Chizma geometriya”. o‘quv qo‘llanma, T.: Fan va texnologiyalar. 2017 yil, 208 bet.
17. SH.K.Murodov. “Injenerlik grafikasi”. O‘quv qo‘llanma–T.: Sano–standart 2013 yil, 176 b.
18. J.Y.Yodgorov. “Geometrik va preyktsion chizmachilik”. O‘quv qo‘llanma –T.: Yangi asr avlodi. 2008 yil, 150 b.
19. M.I.Hurboyev. “Mashinasozlik chizmachiligi”. O‘quv qo‘llanma T.: –Taffakur avlodi, 2020 yil, 170 b.
20. A.Abduraxmonov. “Chizmachilikda grafik ishlar tizimi”. O‘quv qo‘llanma. T.: Cho‘lpon, 2005 yil, 180 b.
21. A.To‘xtayev. “Mashinasozlik chizmachiligi” ma’limotnima. O‘quv qo‘llanma. T.: Ilm–ziyo, 2010 yil, 182 b.
22. Saydaliyev S.S., Xamrakulova M.M. “Qurilish chizmachilik”. O‘quv qo‘llanma. TDPU nashriyoti. 2017 y.

Additional literature:

23. Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. Toshkent, “O‘zbekiston”, 2017 yil, 488 bet.
24. Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini ta’minlash– yurt taraqqiyoti va xalq faravonligining garovi.Toshkent, “O‘zbekiston”, 2017 yil, 48 bet.
25. Mirziyoyev Sh.M. “Erkin va farovon, demokratik O‘zbekiston davlatini birgalikda barpo etamiz”. O‘zbekiston Respublikasi Prezidenti lavozimiga kirishish tantanali marosimiga bag‘ishlangan Oliy Majlis palatalarining qo‘shma majlisidagi nutqi.–T.: “O‘zbekiston”, 2016. 56 b.
26. Mirziyoyev Sh.M. “Tanqidiy tahlil, qat’iy tartib–intizom va shaxsiy javobgarlik–har bir rahbar faoliyatining kundalik qoidasi bo‘lishi shart”. O‘zbekiston respublikasi Vazirlar Maxkamasining 2016 yil yakunlari va 2017 yil istiqbollariga bag‘ishlangan majlisidagi O‘zbekiston Respublikasi Prezidentining nutqi.–Toshkent.: 2017. 104 b.
27. 2017–2021 yillarda O‘zbekiston Respublikasini rivojlantirishning beshta ustuvor yo‘nalishlari bo‘yicha harakatlar strategiyasi.–Toshkent.: 2017.
28. Rahmonov I, Abdurahmonov A. Chizmachilirdan ma’lumotnoma. O‘zbekiston Milliy kutubxonasi nashriyoti. Toshkent,

	2005. 29. L.O‘.Rasul–Zade, Dj.X.Mirhamidov. Chizma geometriya (Perspektiva va soyalar). Toshkent. TAQI, 2015. Internet resources: 30. www.gov.uz–Government Portal of the Republic of Uzbekistan. 31. www.lex.uz–National Database of Legislative Documents of the Republic of Uzbekistan. 32. www.edu.uz–Official website of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan 33. http://ziyonet.uz 34. https://stat.uz 35. www.Autodeks.com 36. www.AutoCAD.ru

Fan name	Metrology and standardization . 4 ECTS
Subject/module code	MS1404
Science teachable semesters	4 th semester
Attached teacher	Rakhmonov Furqat Abduhakimovich, head teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Study hours (including independent learning)	Total hours - 120. Auditory training hours -48. Lecture training hours - 24 Laboratory training hours - 12 Practical training hours - 12 Independent education -72 hour
ECTS	4
Science goals and objectives / learning outcomes	The goal of teaching science is to form and develop logical thinking and technological thinking in students, to teach them to clearly state their opinions and conclusions in a well-founded manner, and to include them in the content of science. The task of science. Within the framework of the issues to be addressed in the process of mastering the subject "Metrology and Standardization", the bachelor: - should know the types of measurements and test methods for evaluation; types of measurement systems developed in enterprises, their differences; types of audits and their procedures; procedures and stages of standardization of quality systems; procedures for inspection and control of standardization regulatory documents systems and the selection and use of international standards for specific conditions in these activities; - the student must have the skills to understand the requirements of the standards used in standardization; to organize the measurement system on a technical and economic basis based on the specifics of the product production technology; to understand and calculate production modes in the standardization of the measurement system; to correctly identify the objects of the system of regulatory documents taking into account technological parameters; It is important for students to master the subject of "Metrology and Standardization" to use advanced and modern teaching methods and introduce new information and pedagogical technologies. Learning outcomes: 1. " Metrology " and standardization ” science studies its development, history and prospects. 2. " Metrology " and standardization ” describes the concepts of science 3. " Metrology" and standardization ” can apply qualitative and quantitative methods of science 4. " Metrology" and standardization ” the basic standards of science describes and can explain the difference between 5. " Metrology" and standardization ” can analyze the properties of science. 6. " Metrology" and standardization ” the basic laws and rules of science can explain. 7. " Metrology" and standardization ” one of the sciences how many methods hand takes . 8. " Metrology" and standardization ” can analyze the use of science in the field.
Course content (topics)	I. Home theoretical part (Lecture)

Subject 1: Introduction . Metrology and standardization science goal and tasks . Measurements unity provision system .

Subject 2: Of greatness size . Metrology in the field used main terms and definitions .

Subject 3: Metrological supply about concept . Metrological of supply goal and tasks .

Subject 4: Measurement of tools type confirm . Measure of tools metrological descriptions .

Subject 5: Measurement tools comparison . Measurement sectors .

Subject 6: Uzbekistan Republic of Standardization system . Standardization system goal and tasks ..

Subject 7: Uzbekistan To standardize in the Republic circle normative documents Categories and their designation . Stages of development of regulatory documents.

Subject 8: Standardization main regulations . Standardization about law essence .

Subject 9: Standards and measurement tools over state control . State metrological inspection and control application fields and objects .

Subject 10: Standard confirmation and state from the list transfer . Product create and working to release organization system .

Subject 11: Standardization advantage aspects of standards to oneself typical Features . Standardization system .

Subject 12: Standardization methods

II. Guidelines and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and competencies in conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions.

Suggested topics for laboratory work:

1. Stangen tools with measurement their work to do .
2. Micrometric tools with measurement their work to do .
3. Ammeter and voltmeter from comparison transfer
4. Sound level meter device elements.
5. Ultrasonic thickness gauge for metal and plastic. (Leeb 332) device elements.
6. Elements of the ultrasonic flaw detector CTS-9008 PLUS device.

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. Metrology in the field used main terms and definitions essence .
2. Metrological of supply main purpose .
3. Calculation of conditions of open electrical networks
4. Standardization system about main information place .
5. Standards and measurement tools over state control importance .
6. Standards confirmation and state from the list transfer order .

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. Study the basic concepts and definitions of metrology. 2. Measurement types . 3. Studying standards, their types, development procedures, approval and registration procedures. 4. Study of standardization methods. 5. Study certification schemes. 6. Standardize and codify product information. 7. International organizations for metrology and standardization. 8. Metrology and metrological support 9. Modern measuring instruments and their descriptions 10. Estimating measurement uncertainty . 11. Ensuring the uniformity of measurements and standards . 12. Technical regulations and their development 13. The role and importance of standards in quality management 14. Certification and its legal and regulatory support . 15. Certification process in the release place .
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.Badalov.NJ . Metrology and standardization.Textbook.2023.303 pages. 2. Ismatullaev PR, Matyakubova PM, Turaev Sh.A. Metrology , standardization and Certification . Textbook . “ Lisson -press”, Tashkent, 2015. -423p. 3.Abduvaliev AA, Latipov VB, Umarov AS and Dr. Basic standardization, metrology, certification and quality control. - T.: NIISMS 2007. - 555 p. 4. Ismatullaev PR, Kodirova Sh.A. Metrology Basics . Study manual . Tashkent, “ Tafakkur ” publishing house 2012. -304 pages. 5. Kadyrova Sh.A. , Jabborov H.Sh. “ Metrology” and from the subject of " standardization " educational-methodical complex , T.:2020 Additional literature: 6. Mirziyoyev Sh.M. Erkin and prosperous , democratic Uzbekistan state together build we will . Uzbekistan Republic President's to the				

	position to enter solemn to the ceremony dedicated High Assembly of the wards joint in the assembly speech . –T.: “ Uzbekistan ” NMIU, 2016. – 56 p. 7. Mirziyoyev Sh.M. Law priority and human interests provision – national development and people of well-being pledge . Uzbekistan Republic Constitution acceptance 24th anniversary of its creation dedicated solemn ceremonial lecture December 7 , 2016. – T.: “ Uzbekistan ” NMIU, 2016. – 48 p. 8. Mirziyoyev Sh.M. Buyuk our future brave and noble our people with together we will build . - T.: “ Uzbekistan ” NMIU, 2017. – 488 p. 9. Uzbekistan Republic further develop according to Actions strategy on . - T.: February 7 , 2017 , Decree No. PF-4947 . 10. Ismatullaev PR and etc. Metrology , standardization and Certification . Textbook . Tashkent , 2001, -360 p . Abduvaliev A.A. i dr. "Basic standardization, metrology, certification and management of quality" Tashkent, NIISPS, 2007. 11. Ismatullaev PR, Kadirova SH.A., Umarova NS Methodological instructions for conducting practical training in metrology, standardization and certification. TDTU 2013. Internet sources: 1.http :\\www.gov.uz – Uzbekistan Republic Government official website . 2.http:\\www.lex.uz – Uzbekistan Republic law documents information national base 3.http:\\www.standart.uz – “ O'zstandart ” agency 4.http:\\www.smsiti.uz - Standardization , metrology and certification scientific research institute 5. http :// www . easc . org . by – Mezghosudarstvennyy Sovet po standardizatsii, metrologii i sertifikatsii Sodrujestva Nezavisimyy Gosudarstv. 6.http:\\www.ziynet.uz – Education portal 7.http:\\www.window.edu.ru - Whole Russia education portal Abduvaliev AA, Latipov VB, Umarov AS Alimov MN, Khakimov O.SH., Khvan VI Standardization , metrology , certification , quality . – Tashkent: SMSITI, 2008. " Metrology " Basics of Education " manual . Ismatillaev R. Kadirova SH. Tashkent 2021. Metrology , standardization and certification AAQurbonov training manual 2018. Ismatullaev PR , Kadirova Sh.A. “ Metrology , standardization and "certification " subject training manual .

Name of subject	Industry Economics and Management (ECTS 4)
Subject/module code	SIM 1604
Science taught semester(s).	6 th semester
Responsible teacher	Umarova Zevi Odilovna
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 120 Auditorium hours - 48 Lecture hours - 24 Practical training hours - 24 Independent study - 72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject It aims to teach methods of managing the activities of an industrial enterprise in the context of modernization of the economy and structural changes in industrial sectors. The task of the subject The economics of an industrial enterprise is to manage it, increase the costs, income, competitiveness, efficiency of enterprises, assess the level of external and internal factors affecting it, teach the innovative and investment activities of the enterprise, the requirements for the workforce, and develop the skills to apply them in practice. To achieve this goal, the subject performs the tasks of forming students' worldviews in terms of theoretical knowledge and practical skills. Learning outcomes: Without ensuring the reliable operation of the electric power network, it is impossible to increase the industrial potential of economic sectors and regions of the country, stimulate the development of entrepreneurial activity, increase the well-being of the population and improve the quality of life. In modern conditions, the development of a competitive environment in the electric power network and the attraction of investments require a fundamental improvement of the institutional and organizational and legal framework for activities in the field of electricity generation and supply. The discipline "Industrial Economics and Management" is of particular importance in training young specialists who understand both the theoretical and practical essence and significance of the economic foundations of this very important sector, who are able to feel all the innovations and organizational changes in this regard. This discipline program covers the essence and types of the enterprise, its role and significance in a market economy, factors and ways of organizing its rational use, as well as the results of socio-economic reforms in the republic and the impact of regional problems on the management perspective. This discipline plays a special role in the development of industry, in particular, in determining the prospects of an industrial enterprise, in selecting the goals and objectives of forming a modern and rational management system in the enterprise,

	and in assessing the level of external and internal factors affecting the enterprise.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: The content and tasks of the discipline "Industrial Economics and Management". The subject and object of research of the discipline "Industrial Economics and Management". The goals and tasks of the discipline "Industrial Economics and Management". Topic 2: An enterprise is a market entity conducting independent economic activity. The place and role of an enterprise in the development of the country's economy. Features and tasks of an enterprise. Classification of enterprises. The structure of an enterprise and its determining factors. Topic 3: Production funds and production capacity of industrial enterprises. The economic essence and significance, composition and structure of fixed assets in industrial enterprises. Valuation of fixed assets. Obsolescence of fixed assets. Types of depreciation of fixed assets. Methods for determining the amount of depreciation of fixed assets and depreciation allowances. Indicators of the use of fixed assets and ways to improve them. Topic 4: Working capital of industrial enterprises. Understanding the working capital of industrial enterprises, their composition and structure. The norm of working capital. Indicators of the use of working capital. Topic 5: Personnel of industrial enterprises and labor motivation. Personnel and their description in industrial enterprises. Personnel structure and their planning. Placement of personnel, their advanced training and retraining. The system of organizing wages in industrial enterprises in the conditions of market relations and its functions. The tariff system and its elements. Forms of payment of wages. Topic 6: Organization and management of production at enterprises. The content and essence of the organization of production. Principles and methods of organizing production. Production organization system. Directions for improving the organization of production at the enterprise. Topic 7: Planning at industrial enterprises. The content and essence of planning and forecasting in a market economy. Principles and methods of planning. System of plans in a market economy. Organization of drawing up and approving a production plan. Directions for improving planning at the enterprise. Topic 8: Production costs, product cost and price at industrial enterprises Theory of product cost. Grouping of costs that form the cost of production of products at industrial enterprises. Cost structure, factors influencing it. Topic 9: Investment and innovation of industrial enterprises Topic 10: Three-winding transformers. Switching diagram and its parameters. Transformers with separate windings. Topic 11: Calculation of power flows in simple closed electrical

networks with and without losses.

Topic 12: Calculation of power and voltage distribution in networks supplied from both sides. Calculation of power flows in networks supplied from both sides, taking into account losses. Calculation of voltage distribution in networks supplied from both sides.

Topic 13: The importance of ensuring active power balance in the electrical system. Frequency deviation and oscillation in the electrical system. Permissible frequency deviation value. Frequency adjustment in turbines. Automatic frequency unloader. Frequency adjustment in the electrical system.

Topic 14: Personnel management in industrial enterprises

Subjects and objects of personnel management. Principles and methods of personnel management. The main tasks of the personnel management system. Personnel management methods. Qualification grouping of enterprise employees.

Topic 15: Marketing management of industrial enterprises

The essence of marketing, its emergence and development. Marketing as a management function. Marketing strategy and types. Organization of marketing management.

II. Instructions and recommendations for organizing laboratory exercises.

In practical classes, special attention is paid to consolidating the theoretical knowledge presented in the lecture, expanding and deepening the knowledge gained in the subject, developing students' research and cognitive skills, and applying the knowledge acquired in the process of theoretical training in practice.

It is intended to consolidate knowledge on the subject and achieve the formation of skills using the recommended literature. The main goal of the seminar classes, conducted using interactive methods of modern pedagogical technology, is to form students' active work and independent thinking, self-assessment and respect for the opinions of others, independent work and teamwork skills.

Recommended practical topics:

1. The content and function of the discipline "Industrial Economics and Management".
2. An enterprise is a market entity conducting independent economic activity
3. Production funds and production capacity of industrial enterprises.
4. Working capital of industrial enterprises
5. Personnel of industrial enterprises and labor motivation.
6. Organization and management of production at enterprises.
7. Planning at industrial enterprises
8. Production costs, product cost and price at industrial enterprises.
9. Investment and innovation activities of industrial enterprises.
10. Income and efficiency of industrial enterprises
11. Organizational structure of industrial management
12. Management methods of industrial enterprise management.
13. Ways of making management decisions and improving them
14. Personnel management at industrial enterprises
15. Marketing management at industrial enterprises

	III. Independent study and independent work. Independent study includes, in addition to preparing for lectures, seminars (practical, laboratory) (Note: given based on the curriculum), assignments given within the framework of additional topics that are not specified in the subject program, but expand the student's knowledge in the subject. Independent study for recommended topics: 1. Industrial enterprise and its management 2. Organization and management of production at enterprises 3. Competitiveness in industry and its management 4. Personnel of industrial enterprises and labor motivation. 5. Economic methods of managing industrial enterprises 6. Profitability of industrial enterprises and ways to calculate it 7. Ways to manage production efficiency 8. Ensuring and regulating production processes 9. Managing and estimating costs of innovative activities 10. Analysis of methods of managing innovative costs 11. The importance of assessing innovation efficiency 12. Long-term assets and depreciation policy of industrial enterprises 13. Financial diagnostics of industrial enterprises 14. Methods of assessing investment efficiency in industrial enterprises 15. Product assortment, valuation, product sales and distribution management
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. Ortiqov A. Sanoat iqtisodiyoti. Darslik. -T.:Sano-Standart, 2014. -304 . 2. Махмудов Е.Х. Экономика промышленных предприятий. Учебник. -Т.-Iqtisodiyot - 2015 . -370 с. 3. Иванов И.Н., Беляев А.М. и др. Производственный менеджмент. Учебник для бакалавров/ под. ред. И.Н. Иванова. - М.:Юрайт, 2013. - 574с. 4. Ulashev I.O., Atamurodov SH.A. Korxona iqtisodi va						

menejmenti. -T.:Tafakkur bo'stoni, 2013

Additional literature:

5. Mirziyoyev Sh.M. O'zbekiston Respublikasida Elektr Energetika tarmog'ini yanada rivojlantirish va isloh qilish strategiyasi to'g'risida 2019 yil 27 martdagi PQ-4249-son

6. Mirziyoev Sh.M. Tanqidiy tahlil, qat'iy tartib-ingizom va shaxsiy javobgarlik -har bir rahbar faoliyatining kundalik qoidasi bulishi kerak. Uzbekiston Respublikasi Vazirlar Maxkamasining 2016 yil yakunlari va 2017 yil istiqbollariga bag'ishlangan majlisidagi O'zbekiston Respublikasi Prezidentining nutqi. // Halq so'zi gazetasi. 2017 yil 16 yanvar, №11. O'zbekiston Respublikasi Konstitutsiyasi - T.: O'zbekiston, 2014.-46

7. O'zbekiston Respublikasi Konstitutsiyasi. - T.: O'zbekiston, 2017. - 46 b.

8. H.A.Хашимова. Антикризисное управление предприятием. Учебное пособие -Т.-Тафаккур қаноти 2016/ -284 б;

9. N.X.Gulyamova. Sanoat iqtisodiyoti va menejmenti.O'quv-uslubiy qo'llanma.T.: 2013.148 b.

10. G.Taraxtiyeva. Innovatsion menejment. O'quv qo'llanma. T.: "Fan va texnologiya", 2013. 208 b

11. Isxaqov A.K., Djurayev X.Z., Urmanova D.T., Shogaipova G.Z., Umarova Z.T. "Soha iqtisodiyoti" fanidan amaliy mashg'ulotlarini o'tkazish bo'yicha uslubiy ko'satma. -T.: TDTU, 2010.

12. Zaynutdinov SH.N. "Menejment nazariyasi". Darslik.-T.: Iqtisodiyot, 2014

13. Qosimova D. S. Menejment nazariyasi: Darslik - T.: Tafakkur-bo'stoni. 2011. 336 b.

Internet resources:

1. <http://www.ziyonet>
2. <http://www.stat.uz>
3. <http://www.norma.uz>

Name of subject	Philosophy (ECTS 4)
Subject/module code	FAL1604
Science taught semester (s).	6 th semester
Responsible teacher	Tajibayev Mukhiddin Abdurashidovich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120. Audience Training hours - 60. Lecture training hour – 30 Laboratory training hour – 0 Practical training hour – 30 Independent education -60 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop students' skills in the purposeful use of secular, philosophical, scientific, and moral knowledge acquired in the higher education system in social and spiritual life. The task of the subject is to form philosophical, scientific and moral knowledge in young students, to understand the social significance of philosophical, natural-scientific knowledge, the evolution of techniques and technologies as a response to human pragmatic needs, the relationship and difference between national values, culture and mass culture, the importance of ensuring the harmony of practice and activity in understanding the world and reality, the role of correct thinking in achieving positive goals, to know the causes and forms of global corruption, to combat them, to fully demonstrate secular knowledge and skills in the process of reforms in the renewing Uzbekistan, to form a sense of social and professional responsibility and a worthy contribution to the development of society. Learning outcomes: 1. Studies the subject of science, theoretical and methodological foundations, stages of development and its role in the development of society, the characteristics, teachings and ideas of Eastern and Western philosophy of the Ancient and Medieval Ages, Modern and Modern philosophy 2. Describes the philosophical laws of the processes taking place in nature and society, the problems of thought and being, substance and matter, space and time, natural philosophy and ecology, energy, human existence, etc. 3. Learns to philosophically analyze the methods, laws and categories of philosophy, the philosophy of development and progress, the unity of theory and practice in understanding reality, and the methodology of knowledge 4. Describes the use of logical analysis tools and can explain the difference between ideas 5. Through the study of philosophy, understands the essence of socio-political processes in the life of society, analyzes them and evaluates them from the perspective of philosophical, systematic thinking 6. Collects, stores and uses information on the development of society can use, logically analyze, accept information related to their professional activities based on analytical and synthetic thinking, and make independent decisions based on observational thinking 7. It provides for the full manifestation of secular knowledge and skills in the process of reforms in the modernizing Uzbekistan.

Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: The essence of philosophy and its role in the development of society. Topic 2: Eastern philosophy and its role in social development. Topic 3: Priority areas of Western philosophy and their impact on the development of science. Topic 4: Philosophy of Being. Topic 5: Philosophy of Development. Topic 6: Philosophy of Knowledge. Topic 7: Logic. Topic 8: Philosophy of Society. Topic 9: Philosophy of History, Civilization and Culture. Topic 10: Philosophy of Man. Topic 11: Philosophy of Values. Topic 12: Ethics. Topic 13: Aesthetics. Topic 14: Global Processes and Philosophy of Sustainable Development. Topic 15: The Essence, Consequences and Mechanisms of Combating Corruption. II. There are no laboratory exercises. III. Practical training instructions and recommendations The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform. Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions. The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view. The following topics are recommended for practical training: 1. The essence of philosophy and its role in the development of society 2. Eastern philosophy and its role in social development 3. Priority areas of Western philosophy and their impact on the development of science 4. Philosophy of being 5. Philosophy of development 6. Philosophy of knowledge 7. Logic 8. Philosophy of society 9. Philosophy of history, civilization and culture 10. Philosophy of man 11. Philosophy of values 12. Ethics 13. Aesthetics 14. Philosophy of global processes and sustainable development 15. The essence, consequences and mechanisms of combating corruption IV. Independent learning 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.

It is recommended that students write essays, abstracts, tests, glossaries, and presentations on topics that are being studied independently.

Recommended topics for independent study:

1. Classify the definitions of Eastern and Western thinkers on the essence of philosophy and prepare a presentation on them.
2. Read Seneca's "Ethical Letters to Lucilius" and prepare an essay based on these letters in which students evaluate their own lives and activities
3. Comparative analysis of Abu Nasr Al-Farabi and Al-Ghazali's views on philosophy (based on Al-Farabi's "Political Philosophy" and Al-Ghazali's "The Chemistry of Happiness").
4. Prepare an essay on the directions and essence of non-classical ontology (based on M. Heidegger's "Being and Time")
5. Prepare an essay on the topic "Classification of Categories in the Ontology of Aristotle, Al-Farabi and Kant" (prepare a crossword puzzle).
6. Prepare an essay on the methods of building a family and ideas about raising children in A. Fitrat's "Family Work".
7. Preparing an essay on A. Fitrat's views on the "Two Categories of Unhappy People" in his treatise "The Leader of Salvation", holding a video competition.
8. Comparative analysis of Avloni's article "Culture Waves" and E. Toffler's work "The Third Wave", preparing a presentation.
9. Preparing an essay on the topic "Information Society and Its Prospects" (based on a comparative analysis of the works of A. Toynbee, E. Toffler).
10. Preparing an essay on the topic "The Importance of Works of Art in the Aesthetic Perception of the World".
11. Preparing a video on the topic "Commonality and Differences in the Cultures of the Peoples of the World".
12. Preparing a crossword puzzle on "Myths of the Peoples of the World".
13. Analysis of the essence of J. Rumi's story "The Hunter and the Falcon" and its educational significance (based on the work "Ichindagi Ichinnadadir").
14. Preparation of an essay on the topic "Advantages and shortcomings of modern moral education".
15. Preparation of an essay on the topic "Dialectic of coevolution and environmentalism" (identification of information about animals and plants included in the Red Book of Uzbekistan). Preparation of a crossword puzzle on the topic of the nature of Uzbekistan.
16. Analysis of the articles "Address to the Youth" and "Address to the Honorable Youth" by M. Behbudi and preparation of an essay.
17. Preparation of a presentation on Machiavelli's work "The Judge".
18. Analysis of Ghazali's work "Repentance" and identification of the disasters in the students' own activities and preparation of an essay assessing themselves.
19. Comparative analysis of Ibn Tufail and Ibn Sina's treatise "Khay ibn Yakzan oğlu" and preparation of an essay.
20. Conducting a quiz on the topic "The essence of corruption and its consequences", organizing a video competition.
21. Preparing an essay on the topic "Mechanisms for combating corruption in Uzbekistan".
22. Analyzing ideas on social governance based on Nizamulmulk's

	"Policy" and preparing an essay 23. Reading S. Huntington's "Clash of Civilizations" and preparing an essay on its essence.
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. Shermuhamedova N. Falsafa, darslik – Toshkent: Idris Abdurauf nashr, 2021.667-b. 2. Davronov Z., Shermuhamedova N, Qahharova M, Nurmatova M, Husanov B, Sultonova A. Falsafa, o'quv qo'llanmasi – Toshkent: TMU, 2019. – 375 b 3. Saifnazarov I., Muxtorov A., Ernazarov D, Usmonov F. Falsafa, o'quv qo'llanmasi – Toshkent: Innovation rivojlanish nashriyot –matbaa uyi, 2021. – 424 b. 4. Madayeva Sh., Shermuhamedova N.va boshqalar Falsafa, o'quv qo'llanmasi. – Toshkent: 2019 5. Чумаков А.Н. Философия, учебник.– М.: INFRA. 2018.– 320 с. Additional literature: 6. Mirziyoyev Sh.M. Yangi O'zbekiston taraqqiyot strategiyasi. –Toshkent: O'zbekiston, 2022. – 416 b. 7. Mirziyoyev Sh.M. Erkin va farovon demokratik davlatini birgalikda quramiz. – Toshkent: O'zbekiston, 2021 8. Muxammadjonova L.A. Davlat xizmatchisi etikasi va imidji. – Toshkent: Universitet, 2017. 9. Ўзбекистоннинг коррупцияга қарши кураш стратегияси/Алиев Б, Мухтаров А., Норов Т., / ўқув қўлланма. – Тошкент: ТДИУ, 2022. –320 б. 10.Nishonova O.Dj. O'zbek etnomadaniyatining estetik xususiyatlari. – Toshkent: Universitet, 2023				

	11.Раматов Ж. Лойко А., Жоголь Н., Кушаков Ф. Основные проблемы философии. –Ташкент: 2022 12.Саифназаров И. Мухтаров А., Абдуллаханова Г, Алиматова Н., Эрназаров Д, Философия. Учебник (для вузов экономических специальностей). – Ташкент: Innovation rivojlanish nashriyoti – matbaa uyi. 2021. – 424 с. 13.Xakimov N.X. Amriddinova D. Jadidchilik ta`limotida komil inson konsepsiyasining falsafiy mohiyati.–Toshkent: Iqtisodiyot, 2023. 14.Sharipov M. Mantiq. – Toshkent: Universitet, 2003 15.Shermuxamedova N.A. Falsafaga kirish –Toshkent: Innovasiya – Ziyo, 2024. Internet resources: 16.www.philosophy.ru.- Encyclopedia of Philosophy 17.www.ziynet.uz. – national educational materials search site. 18.www.edu.uz. website of the Ministry of higher education, science and innovations of the Republic of Uzbekistan 19.www.google.uz. – international educational materials search site. 20.www.gov.uz. – Government portal of the Republic of Uzbekistan. 21.www.lex.uz. National database of information on legal documents of the Republic of Uzbekistan.

Name of subject	Ecology (ECTS 4)
Subject/module code	EKO1504
Science taught semester (s).	5 th semester
Responsible teacher	Tuynazarova Iroda Abbuboqiyevna (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120. Audience Training hours - 48. Lecture training hour – 24 Laboratory training hour – 12 Practical training hour – 12 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the discipline is to teach students the theoretical foundations of ecology, the consequences of disrupting the balance of interaction between nature and society, improving the environmental management system, and issues related to increasing the efficiency of natural resource use. The task of the discipline is to highlight the causes of problems in the field of environmental protection and ecology, the scientific foundations of nature conservation, the means of its protection, the application of effective methods, as well as environmental problems, environmental safety and environmental aspects of sustainable development. Learning outcomes: 1. anthropogenic impact of humans on nature; V.I.Vernadsky's doctrine of the biosphere; the cyclical movement of substances in the biosphere; classification of natural resources; structure and composition of atmospheric air; environmental monitoring; 2. sources of pollution of atmospheric air and water bodies; possession of an understanding of the protection of the lithosphere; rational use of natural resources; state and international cooperation in the field of the environment; methods of cleaning the air from dust and toxic cracks; 3. classification of wastewater; 4. methods of wastewater treatment; 5. basic principles of organizing waste-free technological processes; 6. assessment of the environmental situation of the relevant industrial enterprises; 7. have skills in studying environmental problems in industry and solving environmental problems arising in production; 8. identification of sources of environmental pollution, search for ways to neutralize them;
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: The role of ecology in the system of scientific knowledge. Ecology as a theoretical basis for rational nature management and environmental protection. Basic terms and concepts of ecology. Ecological factors. Topic 2: Introduction to energy systems and sustainable development. Sustainable Development Program. Topic 3: V. I. Vernadsky and the modern scientific idea of the biosphere. Boundaries and main components of the biosphere. Natural resources, their classification. Topic 4: The impact of fossil fuels on production and the environment

Topic 5: General access to renewable energy sources

Topic 6: Fundamentals of atmospheric air protection, methods of its purification from sources of pollution, toxic gases and dust.

Topic 7: Waste and its types. Energy calculation and carbon emissions. Waste-free and low-waste technology.

Topic 8. Hydrosphere and its protection. Wastewater treatment methods.

Topic 9: Lithosphere and its problems. Demographic trends, changes in the Earth's population as a factor determining the intensity of anthropogenic impact.

Topic 10: The concept of monitoring, tasks, purpose, research object, methods, and types of environmental monitoring.

Topic 11: Climate mitigation strategies. Socio-ecological problems of Uzbekistan. Global environmental problems.

Topic 12: Energy policy and environmental standards. International cooperation in the field of ecology and environmental protection. Ecological education and upbringing.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and abilities through determining indicators of ecological processes, conducting experiments, and using tables. Recommended topics are selected based on existing conditions and technical capabilities.

Recommended topics for laboratory work:

1. Approximate determination of wastewater turbidity.
2. Determining the technological parameters of horizontal settling tanks.
3. Determination of the amount of suspended substances in wastewater by gravimetric method by filtering through a filter.
4. Methods of physicochemical wastewater treatment.
5. Wastewater purification from organic substances by the adsorption method.
6. Determining the ecological properties of soil.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation of the norms for the release of harmful substances into the atmosphere and permissible emissions.
2. Calculation of dust emissions into the atmosphere and permissible norms.
3. Distribution of harmful gases into the atmosphere and calculation of their permissible limits.
4. Calculating the concentration of dust emitted into the atmosphere and comparing it with the REC.
5. Calculation of the REM and its comparison with the total emissions of the enterprise, as well as submission of proposals for reducing dust.

	6. Calculation of wastewater treatment level. IV. Independent learning 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. Nature and man. 2. Biosphere. Structure and function. 3. Man and the biosphere. 4. Global environmental problems. 5. Environmental problems of the Republic of Uzbekistan. 6. Urbanization process and environmental problems. 7. Ecology and demography (population growth). 8. Ecology and international relations. 9. Problems of air pollution. 10. Greenhouse effect. 11. Energy industry and environment. 12. Acid rains 13. Transport & Environment 14. Ozone layer depletion and its negative consequences 15. Alternative energy sources 16. Hydrosphere. Water use problems 17. Wastewater treatment methods 18. Lithosphere and related problems 19. Soil pollution 20. Plant and animal protection problems
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. Richard O. Mines, Jr."Environmental Engineering" This edition first published 2014, Wiley & Sons, Inc, 111 River Street, Hoboken, New Jersey, 2014, XII, 637 p. ISBN 978-1-118-80145. 2. Xo'janazarov O', Yakubjonova Sh. Ekologiya va tabiatni muhofaza qilish. 3.Sattorov Z. Ekologiya. Darslik. Sanoat standart.2018				

4. Qudratov O. Sanoat ekologiyasi. O'quv qo'llanma-T. Chinor, 2005.
5. Цветкова Л.И., Алексеев М.И., Усанов Б.П. и др. Экология, Учебник для ВТУЗ ов.- М : издательство АСВ, СПб, Химизат, 2001.
6. Yodgorova D.Sh, Egamberdiyeva L.SH. Shahar ekologiyasi. Uslubiy qo'llanma. Toshkent. O'zMU nashriyoti, 2013.
7. Tursunov X.T, Raximova T,U. Ekologiya. O'quv qo'llanma. T.Chinor ENK, 2006

Additional literature:

8. Otaboyev SH, Nabiyev N."Inson va Biosfera" Toshkent 1995.
9. Tursunov X.T. "Ekologiya", Toshkent, Saodat RIA. 2007. O'quv qo'llanma.
10. Ibragimov N.I va boshqalar "Ekologiya" Toshkent 2007. O'quv qo'llanma.
11. OtaboyevSh, Malikov Z, Mamadaliyev Sh, Mirsovurov M, "Ekologiya" Toshkent 2011. O'quv qo'llanma.
12. Ergashev A.E. – "Umumiy ekologiya" Toshkent, "O'qituvchi". 2003 y.
13. A.Ergashev, T.Ergashev. "Ekologiya, biosfera va tabiatni muhofaza qilish". Toshkent, "Yangi asr avlodi", 2005
14. Xalilova R.X. "Ekologiya" Toshkent, "O'zbekiston". 2020.
15. R.Sultonov. Ekologiya va atrof muhitni muhofaza qilish asoslari. Musiqa T:2007 215-bet.
16. D Yormatova. Ekologiya. Toshkent "Fan va texnologiya", 2012 yil 189-bet
17. Yu Shodimetov. "Ijtimoiy ekologiya" (Sotsioekologiya)1,2-darslik Toshkent 2017 y. 135-bet
- 18.T.Ergashev, A.Ergashev, "Gidroekologiya". Toshkent, "Asian Book House", 2020 9-bet.
19. S.Turabjanov – "Muhandislik ekologiyasi" Toshkent, "Asian Book House" 2020 y. 166-bet.

Web sites:

1. http: www.ecologye.ru
2. http: www.ecolog.com
3. http://iea.org/
4. http://www.renewableenergyworld.com/

Name of subject	Life safety(ECTS 4)
Subject/module code	XFX1704
Science taught semester (s).	7 th semester
Responsible teacher	Bobomurodov Zokir Abduqahhorovich PhD associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120. Audience Training hours - 48. Lecture training hour – 24 Laboratory training hour – 12 Practical training hour – 12 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject The purpose of the course is to teach future specialists the causes, characteristics, consequences of hazards that arise in their life activities, the rules for their elimination, the creation of safe working conditions, the protection of the population from natural, man-made, ecological and other emergencies, their theoretical and practical protection, and the rules for providing primary medical care to injured persons. To achieve this goal, the subject performs the tasks of forming students' theoretical knowledge, practical skills, a methodological approach to phenomena and processes, and a scientific worldview, the types of emergencies that may occur during their activities, methods for analyzing their causes and consequences, and the skills of using means of preserving and rescuing people and material assets in emergencies that may occur during their activities. The task of science- is to theoretically and practically prepare people to ensure safety in production and in emergencies, to create good working conditions, and to teach and educate them on how to act in extreme situations. Learning outcomes: 1 Labor rights in the organization of production activities and their study 2 Creating safe working conditions in production processes: 3 Creating safe working conditions in production processes: 4 Taking fire safety measures 5 Understanding industrial sanitation and occupational hygiene:
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1. Fundamentals of life safety. Ensuring life safety. The concept of life safety. Basic concepts and terms of life safety. Components of life safety and their objects of verification. Theoretical foundations of life safety. Topic 2. Protection of the population and territories in emergencies of a technogenic nature. Analysis of activity safety. Basic concepts of life safety, their content. Hazards, their classification. Principles and methods of ensuring activity safety. The human factor in the “man - environment” system Topic 3. Safety problems in video terminals. The first electronic calculating machine (EXM) was created at the University of Pennsylvania at the end of World War II; it was created at the expense of the US military court and was intended to calculate the flight trajectory of artillery shells. Topic 4. Labor protection laws and organizational foundations. Certification of workplaces.

In production, each workplace is assigned a specific task. Otherwise, this workplace may become: overloaded, underloaded, or completely redundant.

In our country, women are guaranteed equal rights with men. This right is rightly emphasized in the Labor Law.

Topic 5. Protection of the population and territories in the event of accidents at radiation (nuclear) hazardous facilities with the release of radioactive substances into the environment.

Radioactive substances are used for various purposes in a number of scientific research institutions and industrial enterprises.

Topic 6. Protection of the population and territories in the event of accidents at chemically hazardous facilities with the release (spill) of environmentally hazardous chemicals.

Evacuation of the population and first aid in the event of accidents at chemically hazardous facilities with the release (spill) of environmentally hazardous chemicals.

Topic 7. Protection of the population and territories in natural emergencies.

Evacuation of the population and first aid in natural emergencies.

Topic 8. Basic requirements for ventilation devices at industrial enterprises.

The ventilation system is a complex engineering device. Each element of it performs a specific function. Therefore, before putting the ventilation system into operation, it is subjected to technical and sanitary-hygienic tests.

Topic 9. Protection of the population and territories in technogenic fires.

Evacuation of the population and first aid in the protection of the population and territories in technogenic fires.

Topic 10. Protection of the population and territories in the event of earthquakes, floods and natural fires.

Evacuation of the population and first aid in the event of protection of the population and territories in the event of earthquakes, floods and natural fires.

Topic 11. Protection of the population and territories in emergencies of a biological, social and military nature.

Topic 12. Psychological resilience in emergency situations and methods of its formation. Ensuring security in society.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies 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. Study of equipment safety and laboratory work.
2. Determination of microclimatic conditions in industrial enterprises and institutions.
3. Determination of the concentration of harmful substances.
4. Determination of natural lighting in production and enterprises.
5. Determination of noise and vibrations in industrial enterprises.
6. Determination of the combustion temperature of materials.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the

amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Legal basis of labor protection. Analysis of accidents and occupational diseases in organizations.
2. Study of the microclimate of industrial buildings. Study of natural and artificial lighting in production.
3. Fundamentals of safety. Calculation of noise and vibrations in production
4. Electrical safety. Evacuation.
5. Personal protective equipment.
6. Fire safety. First aid..

IV. Independent learning 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. Scientists of the world and our country who have made a significant contribution to the study of HFX problems. Their main scientific and practical works.
2. Analysis of numerical, point and other methods of quantifying risks.
3. Analysis of the principles and methods of ensuring safety.
4. Analysis of safety conditions at different stages of activity.
5. Analysis of ergonomic indicators of ensuring safety of activity.
6. Requirements for organizing the workplace.
7. The influence of human anthropometric indicators on the safety of activity.
8. The importance of psychological factors in ensuring the safety of activity.
9. The system of laws and regulatory documents adopted in the Republic of Uzbekistan in the field of ensuring the safety of life and activity.
10. Compilation of a glossary on the science of life and activity safety.
11. The importance of physiological and psychological characteristics of a person in ensuring safety.
12. The importance of human anatomy (anthropometric parameters) in ensuring safety.
13. Analysis of international experience and research on ensuring the safety of life activities.
14. Analysis of laws and regulatory documents adopted in foreign countries on ensuring the safety of life activities.
15. Grouping and structure of technical means of protection against noise and vibration.
16. System of regulatory documents containing technical safety requirements for machines and mechanisms.
17. State Fire Safety Service.
18. Analysis of static data on the occurrence of fires and the damage caused by them in the republic.
19. Modern technical means of fire protection.

	20. International terrorism and terrorist organizations.
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.A. Mark, P. Friend James Fundamentals of Occupational Safety and Health. Bernan Press. Germaniya, 2007 2.A.Qudratov,T G‘aniyev, O‘Yo‘ldoshev, F.Y.Yormatov,N.Xabibullayev “Hayot faoliyati xavfsizligi”,Toshkent ”Aloqachi” 2005 y. 3. H.E. G‘oyipov "Mehnat muhofazasi" T.: "Mehnat" 2003 y 4. G‘. Yormatov, Yo. Isamuxamedov "Mehnatni muhofaza qilish" T.: "O‘zbekiston" 2002 y 5. X. Rahimova, A. A‘zamov, T. Tursunov "Mehnatni muhofaza qilish" T.: "O‘zbekiston" 2003 y 6. O‘.Yo‘ldoshev, U. Usmonov, O.Qudratov "Mehnatni muhofaza qilish" T.: "Mexnat" 2001 y 7. A. A‘zamov, T. Tursunov va boshqalar "Mehnatni muhofaza qilish" T.: "Sano-standart" 2013 y 8. A. Qudratov, T. G‘aniyev va boshqalar "Hayot faoliyati xavfsizligi" T.: "Aloqachi" 2005 y 9. A. Qudratov, T. G‘aniyev "Hayot faoliyati xavfsizligi" T.: "Mehnat" 2004 y 10. H.X.Razzoqov, Sh.A.Mamasov "Hayot faoliyati xavfsizligi" Toshkent 2019 y 11. G‘.Yormatov, O‘.Yo‘ldoshev, A.Hamrayev "Hayot faoliyati xavfsizligi" Toshkent 2009 y 12.A.Norboyev, O.Qulto‘rayev, Avliyoqulov, M.Ziyoyeva “Hayot faoliyati xavfsizligi” Toshkent ”Iqtisod-Moliya” 2017 Additional literature: 13.Mirziyoyev Sh.M. Tanqidiy tahlil, qat’iy tartib-intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidasi bo‘lishi kerak. O‘zbekiston Respublikasi Vazirlar Mahkamasining 2016-yil yakunlari va 2017-yil istiqbollariga bag‘ishlangan majlisidagi O‘zbekiston Respublikasi Prezidentining nutqi. // Xalq so‘zi gazetasi. 2017-yil 16 yanvar, №11. 14.O‘zbekiston Respublikasi Konstitutsiyasi – T.: O‘zbekiston, 2014. –				

	46 b. 15.“Mehnatni muhofaza qilish to‘g‘risida”gi (yangi tahriri) O‘zbekiston Respublikasi Qonuni. 2016 yil 22 sentyabr. 16.Ishlab chiqarishdagi baxtsiz hodisalarni va xodimlar salomatligining boshqa xil zararlanishini tekshirish va hisobga olish to‘g‘risidagi Nizom. Vazirlar Mahkamasining qarori № 286, 06.06.1997, –T.: 1997. 17.“Ishlab chiqarishdagi baxtsiz hodisalar va kasb kasalliklaridan majburiy davlat ijtimoiy sug‘urtasi to‘g‘risida”gi qonun. O‘zbekiston Respublikasi qonun hujjatlari to‘plami, 2008 , 37-38-son. Internet resources: 18.www.gov.uz – O‘zbekiston Respublikasi xukumat portali. 19.www.lex.uz – O‘zbekiston Respublikasi Qonun hujjatlari ma’lumotlari milliy bazasi. 20.www.mintrud.uz – Mehnat va aholini ijtimoiy muhofaza qilish vazirligi sayti. 21.www.bilim.uz – OUMTV sayti

Name of subject	Theoretical mechanics (ECTS 4)
Subject/module code	NMEX1404
Teaching Semesters	4 th semester
Responsible teacher	Y. Kuvandikov, PhD., associate professor.
Course language	Uzbek
Connection to the curriculum	Compulsory
Teaching hours (this including independent study)	Total hours-120. Audience Training hours – 48 Lecture training hours – 24 Laboratory training hours – 12 Practical training hours – 12 Independent study -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	I. The content of the subject - The development of all branches of modern technology, technological processes and the requirements imposed on them, taking into account the need to solve new scientific problems, is extremely relevant. The creation of theoretical foundations of mechanical problems that can meet these requirements, in turn, can serve as a practical tool for justifying the purpose of teaching the subject "Theoretical Mechanics" to students. Since the lesson is the main form of education in mastering the subject, it should be scientific, systematic, understandable, conscious and active, with a solid assimilation of knowledge, and organized taking into account the personal characteristics of the student. The purpose of teaching the subject "Theoretical Mechanics" to bachelors is to ensure that they independently solve various problems and innovations that arise in the process of future scientific and technical development. At the same time, studying the subject "Theoretical Mechanics" should help the future bachelor develop his worldview, thinking skills, and the ability to apply theoretical knowledge to solve practical problems. The subject "Theoretical Mechanics" is studied as one of the universal fundamental sciences, like physics and mathematics, and is the basis of all technical sciences. The purpose of teaching the subject is to form in students the appropriate knowledge, skills, and qualifications in methods for determining stresses and deformations in machines and mechanisms and their elements and structures, as well as methods for calculating these structures for strength, stiffness, and stiffness. The task of science is - Students are expected to develop basic skills in design and construction calculations, which are one of the main issues in the design process of machines and mechanisms, to be able to apply the basic methods of analyzing the balance, motion, and interaction of mechanical systems for machine and structure structures in solving technical problems, to be able to build and study mechanical and mathematical models of technical systems, and to develop the skills to study the balance and motion of mechanical systems. Learning outcomes: 1. Conditions of equilibrium of a rigid body under the influence of various systems of forces located arbitrarily in a plane and in

	space, methods for finding the center of gravity of a rigid body; 2. Forms of motion of a rigid body in mechanical motion, laws of mechanical motion taking into account changes occurring in the environment; basic laws and principles of dynamics, differential equations of motion of mechanical systems, general theorems of rigid body dynamics; internal forces arising in structural elements, stresses and deformations arising in simple types of deformation, calculation scheme of buildings and structures and their kinematic analysis; theory of influence lines, displacements arising in elastic systems, methods for calculating static and uncertain systems; 3. Theoretical foundations of science and application of scientific calculation formulas in solving practical problems; correct selection of calculation models of machine and mechanism elements; determination of internal forces and deformations in machine and mechanism elements; selection of calculation schemes for buildings and structures and their kinematic analysis; 4. Theory of influence lines; have the skills to calculate statically definite and uncertain systems under the influence of fixed and moving loads; 5. Apply and implement the knowledge gained in theoretical mechanics in the process of passing engineering and special disciplines; select computational models of machine and mechanism elements, select machine and mechanism calculation schemes and perform their kinematic analysis; 6. determine stresses and displacements in machines and mechanisms; must have the skills to calculate statically definite and uncertain systems.
Course content (topics)	I. Main theoretical part (Lecture) Module 1. Topic 1. Introduction to theoretical mechanics. Basic concepts and axioms of statics. Topic 2. Projection of a force on an axis. System of intersecting forces at a point. Determination of an equal acting force. Topic 3. Balance of intersecting forces at a point. Topic 4. Moment of a force about a point and an axis. Couple force. Couple moment. Topic 5. Friction force. Friction in sliding and rolling. Module 2. Topic 6. Introduction to kinematics. Methods of transmitting point motion. Point trajectory. Topic 7. Determination of velocity and acceleration when the motion is given by a vector, coordinates and natural method. Topic 8. Forward motion of a rigid body. Rotational motion of a rigid body around a fixed axis. Plane parallel motion of a rigid body. Equations of plane parallel motion. Topic 9. Complex motion of a material point. Module 3. Topic 10. Introduction to dynamics. Basic laws of dynamics. Two main problems of dynamics. Topic 11. Elementary work of force. Force. Oscillatory motion of a material point. Topic 12. The magnitude of the momentum of a material point. Theorem on the change in the magnitude of the momentum of a material point.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop basic skills in design calculations, which are one of the main issues in the design of machines and mechanisms, as well as practical skills and qualifications in conducting experiments, calculating and drawing tables and graphs. The proposed topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Experimentally determine the equivalent force of a system of forces on a plane intersecting at one point.
2. Experimentally determine the center of gravity of a homogeneous plate.
3. Experimentally determine the laws of friction force.
4. Determine the speed of an object using angular velocity
5. Study the laws of oscillatory motion.
6. Experimentally study the law of conservation of momentum.
7. Study the motion of an object thrown in a horizontal direction.

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with the study of preliminary 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 training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of a practical training is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

Recommended practical topics:

1. Projection of a force on an axis. Solving problems related to a system of intersecting forces. A system of forces located arbitrarily on a plane. Solving problems related to the equilibrium of intersecting forces at a point.
2. Solving problems related to the moment of a force about a point and an axis. Couple moment. Solving problems related to determining the support reaction forces.
3. Solving problems related to determining the support reaction forces of a rigid body.
4. Solving problems related to determining the friction force.
5. Determining the velocity and acceleration of a point according to the given equations of motion.
6. Problems related to the rotational motion of a rigid body around a fixed axis. Determining the velocity and acceleration of a point in complex motion.
7. Solving problems related to the direct and inverse problems of dynamics.
8. Integrating differential equations of motion of a material point under the influence of constant forces. Problems related to the work of a force and the determination of power. Application of the theorem on the change in the magnitude of momentum to determining the velocity of a material point.

Instructions for organizing computational and graphic

	work The main purpose of performing computational and graphic work: - To develop students' skills in applying the theoretical knowledge they have acquired in practice and to form their independent work. - Each student in the subject performs computational and graphic work on the basis of individual assignments. When performing them, it is recommended to use the methodological instructions developed by the department for performing these computational and graphic works and the questions prepared for independent work. Topics of the recommended computational and graphical works: 1.Task-S1. Determination of the support reaction forces of a rigid body. 2.Task-K1. Determination of the velocity and acceleration of a point according to the given equations of motion. 3.Task-D1. Integrating the differential equations of motion of a material point under the influence of constant forces. IV. IV. Independent study and independent work 1. Simplification of a system of forces located on a plane. 2. Equilibrium of a system of forces located in space. 3. Kinematics of a point. Special cases of motion. 4. Parallel motion of a rigid body in a plane. 5. Forced oscillatory motion of a material point. Resonance phenomenon. The ability to solve problems in science is of great importance. The main way to study certain topics in depth and solve problems is to be able to work independently with textbooks and manuals. The ability to work independently with a book is not only the basis of training an engineer, but also the basis of all his activities. In addition, it is recommended that students use lecture texts for independent mastery of the topics covered. Students' independent mastery of topics is not assessed separately, they are reflected in the current, intermediate and final assessments. Independent study is a mandatory training course for students and is planned in nature. Independent work topics consist of lecture and practical topics planned for independent study. Independent study strengthens students' theoretical knowledge and helps them to master the topics well. It is recommended that students make notes, prepare presentations, prepare abstracts and present them on topics that are independently studied.
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. Sh.A.Shoobidov, X.N.Habibullayeva, F.D.Fayzullayev "Nazariy mexanika" Toshkent "Yangi asr avlodi" nashriyoti 2008 yil. 2. P.Shohaydarova, Sh.Shoziyotov, J.Zoirov. "Nazariy mexanika", "O'qituvchi" nashriyoti. Toshkent-1981. 3. B.A.Fayzullayev "Nazariy mexanika" Cho'lpon nomidagi nashriyot-matbaa ijodiy uyi Tashkent 2011 yil 4. J.Zoirov, B.Ahmadxo'jayev. "Nazariy mexanika" II qism, O'zbekiston Respublikasi Fanlar akademiyasi "Fan" nashriyoti. Toshkent-1998. 157 – 160-betlar. 5.V.I. Szolga, «Theoretical mechanics», Berlin, part-1,2013 y., - 204 p. 6.V.I. Szolga, «Theoretical mechanics», Berlin, part-2,2013 y., - 261 p. 7.F.Smith and W.R. Longley «Theoretical mechanics», New York-London, 2014 y,-288 p. 8.Meshcherskiy I.V. Nazariy mexanikadan masalalar to'plami. O'quv qo'llanma. – T. O'qituvchi, 1990 . – 448 b. 9.Mirsaidov M.M., Boymurodova L.I., Giyasova N.T. Nazariy mexanika. O'quv qo'llanma – T.:O'zbekiston, 2008. – 246 b. 10. Яблонский А.А. Сборник задач для курсовых работ по теоретической механике. Москва: 2000. – 240 с. Additional literature 1. Decree of the President of the Republic of Uzbekistan dated February 7, 2017 No. PF-4947 "On the Strategy of Actions for the Further Development of the Republic of Uzbekistan". 2.Karimov K.A., Habibullayeva X.N. «Mexanik sistema harakatini o'rganishda sistema kinetik energiyasining o'zgarishi haqidagi teoremani qo'llash» Uslubiy ko'rsatma. T.:TDTU, 2013. 3.Karimov K.A., Habibullayeva X.N. «Mexanik sistema harakatini o'rganishda sistema kinetik energiyasining o'zgarishi haqidagi teoremani qo'llash» Uslubiy ko'rsatma. T.:TDTU,2013. 4. Мещерский И.В. Сборник задач по теоретической механике. Учебное пособие.СПб.: Лань,2005. —448с. 5.Бутенин Н.В., Лунц Я.Л., Меркин Д.Р. Курс теоретической механики: Учебник. СПб.:Лань, 2008. – 736 с 6.T. Bultakov, G'.G'.Egamnazarov, X.X.Igamberdiyev Nazariy mexanika. Praktikum. Statika. Information sources 1. www.lex.uz – National database of legislative documents of the Republic of Uzbekistan. 2. www.ziynet.uz – Education portal of the Republic of Uzbekistan. 3. www.ilm.uz. 4. www.zivo.net. 5. http://www.zivo.net 6. http://www.nazmex.ru http://www.books.google.ru				

Name of subject	Theoretical Electrical Engineering (ECTS 9)
Subject/module code	NAZEL 13409
Science taught semester (s).	3 rd and 4 th semester
Responsible teacher	Nurullayev Orziqul Ubayevich, head teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-270. Audience Training hours - 108. Lecture training hour – 48 Laboratory training hour – 30 Practical training hour – 30 Independent education -162 hours
ECTS	9
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject The goal of teaching science is to solve the problem of preparing future specialists, including the electromagnetic field, a form of matter, and the processes that occur in its various devices, methods of analysis, synthesis, and calculation of electric and magnetic fields. The task of the subject The task of the subject is to teach students the theory of electrical circuits and their analysis and synthesis. The task of the subject "Theoretical Electrical Engineering" is to teach its students: -elements of electrical circuits and their basic concepts -basic laws and calculation methods for the analysis of constant and alternating current circuits; -resonance phenomena, self-inductance and mutual inductance; -three-phase circuits, periodic non-sinusoidal currents in electrical circuits; -transient processes in linear electrical circuits; -basic laws and calculation methods for quadrupoles, electrical filters, circuits with scattered parameters; -the theory of nonlinear electrical circuits; -the theory of electromagnetic fields is aimed at mastering their analysis and synthesis Learning outcomes: 1. Constant current linear electric circuits and methods for their calculation are studied. 2. Electric current. Current density. Ohm's law. Electric energy and electric power. Formulation of topological equations of complex electric circuits based on Kirchhoff's laws. Equivalent transformation of circuits consisting of series, parallel and mixed connected elements 3. Single-phase sinusoidal current linear electric circuits are studied, they get acquainted with the effective and average values of sinusoidal current and learn to calculate them. 4. Three-phase circuits. They can explain the difference between three-phase electric circuits and 5. Non-sinusoidal periodic quantities. Non-sinusoidal current circuits. The concept of non-sinusoidal current. Fourier series. Transient processes in electric circuits. The concept of transient processes. Switching laws. Filters 6. Calculation of transient processes in nonlinear circuits. Electrostatic field. Image method. Capacitance absorption. Calculation of the electric field of a constant current. Calculation of the magnetic field of a constant current
Course content (topics)	I. Main theoretical part (Lecture)

Topic 1: Introduction to the subject of "Theoretical Electrical Engineering". The role and importance of theoretical electrical engineering in modern science and technology and in production.

Topic 2: Understanding electrical circuits and elements.

Resistive, capacitive and inductive elements. Ohm's law. Law of electromagnetic induction. Voltage and current sources. Circuit and its topological forms. Calculation of resistance, capacitance and impedance of inductive circuit elements in alternating current circuits.

Topic 3: Methods for calculating electrical circuits.

Kirchhoff's laws. Calculation of simple electrical circuits. Circuits with elements connected in series, parallel and mixed. Calculation of complex electrical circuits. Methods of contour currents and node potentials. First-order circuits with a resistor and a capacitor connected to a current-voltage generator, determination of current or voltage during charging/discharging using a first-order differential equation.

Topic 4: Sinusoidal current electrical circuits.

Concept of sinusoidal current generation and electrical generators. Concepts of frequency, period, phase, initial phase and amplitude. Current voltage, effective (acting) and average values of e.u.k. Power in AC circuits, S, P and Q, current power, active and reactive average power, RMS value, apparent power, power factor

Topic 5: Representation of sinusoidal currents and voltages with vectors and complex numbers. Power. Currents and voltages in circuits with resistors, inductances, and capacitances connected in series. Vector diagrams. Analysis of simple stationary alternating current circuits with resistive, capacitive, and inductive circuit elements using the complex method.

Topic 6: Triangles of resistances and voltages.

Voltage resonance. Currents and voltages in circuits with active resistance, inductive and capacitive elements connected in parallel. Triangles of resistances and currents. Current resonance.

Topic 7: Inductively coupled circuits. Calculation of inductively coupled circuits. Matching, opposing, series and parallel connection of two coils. Concept of transformers. Ideal and real transformers, their useful working coefficient and vector diagram.

Topic 8: Three-phase electrical circuits.

Concept of three-phase electrical circuits. Connecting consumers in the "star" and "delta" configurations. Symmetrical and nonsymmetrical systems. Rotating magnetic field. Concept of asynchronous machines. Measuring power in three-phase circuits. Methods of measuring power in AC circuits

Topic 9: Non-sinusoidal current circuits. The concept of non-sinusoidal current. Fourier series. Effective and average values and power of non-sinusoidal quantities. Calculation of electrical circuits connected to a non-sinusoidal power source.

Topic 10: Transient processes. Concept of transient processes. Switching laws. Classical calculation of transient processes in simple electrical circuits. Aperiodic, limit aperiodic and oscillatory discharge of a capacitor.

Topic 11: Calculation of transient processes using the operator method. Calculation of transient processes using the operator method. Concepts of representation and original. Laplace transform. Operator form of Ohm's and Kirchhoff's laws. Operator scheme. Propagation theorem. Duhamel integral.

Topic 12: Quadrupoles. Passive quadrupoles and their equations and constants. Equivalent circuits. Connections of quadrupoles. Graphs of quadrupoles and their matrices. Transfer functions of quadrupoles.

Topic 13: Filters. Basic concepts and classification of frequency-

division filters. Low-pass filters. High-pass filters, band-pass filters. Methods of calculating filters. Rules for calculating and plotting the transfer function of a filter.

Topic 14: Electrical circuits with discrete parameters.

Basic concepts of electrical circuits with discrete parameters. Equations of a homogeneous line. Operation of a line in a sinusoidal mode, traveling waves. Interference waves.

Topic 15: Theory of Nonlinear Electrical Circuits.

Elements of nonlinear resistive electrical circuits, their parameters and characteristics. Properties, characteristics and parameters of a ferromagnetic core coil.

Topic 16: Calculation of transient processes in nonlinear electrical circuits. Methods for calculating transient processes and elements of the theory of oscillations in linear and curved circuits.

Topic 17: Electromagnetic field theory.

The integral form of the electromagnetic field equation and the magnitudes of electric and magnetic fields. Some concepts of vector analysis. The differential form of the electromagnetic field equation. Electrostatic field. Electric potential gradient. Poisson and Laplace equations.

Topic 18: Theory of a uniform electromagnetic field.

Dielectric cylinder and condition in a uniform external field. Method of representation. Expression of mechanical force in the form of the volumetric density of the electric field energy and the derivative of the electric field energy with respect to the coordinate in which it changes. Energy of the field of a system of charged bodies.

Topic 19: Calculation of the magnetic field of a constant current. The magnetic field of a constant current. Scalar and vector potential of a magnetic field. Electromagnetic field. Maxwell's equations I and II. Electromagnetic field energy. Umov-Poyting theorem

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and competencies in conducting experiments on various connection schemes, calculating and drawing tables and graphs in Theoretical Electrical Engineering. The recommended topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Series connection of energy consumers in an alternating current circuit. (R, L; R, C; L, C).
2. Parallel connection of energy consumers in an alternating current circuit.
3. Mixed connection of energy consumers in an alternating current circuit.
4. Study of the phenomenon of mutual inductance in alternating current circuits.
5. The phenomenon of resonance in a circuit with elements connected in series.
6. The phenomenon of resonance in an electrical circuit with elements connected in parallel.
7. Study of three-phase electrical circuits connected in a star and star method.
8. Study of three-phase electrical circuits connected in a consumer triangle method.
9. Checking non-sinusoidal quantities in electrical circuits.
10. Checking the transition process of discharging a capacitor into active resistance and inductance.
11. Experimental determination of the parameters of passive quadrupole.
12. Investigation of high and low frequency filters.

- 13 Investigation of intermediate and blocking filters (isolators).
14. Investigation of distributed parameter electrical networks.
15. Ferroresonance of voltages.
16. Ferroresonance of currents.
17. Investigation of a ferromagnetic power amplifier.
18. Investigation of a ferromagnetic frequency doubler.
19. Investigation of the refraction of a current occurring at the boundary of media with different relative permittivity.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

Topic1.Reconstruction of DC electric circuits. In parallel or series connection, resistors, coils and capacitors are arranged in a sequential manner

Topic 2. Ohm's and Kirchhoff's laws.

Topic 3. Reconstruction of sinusoidal current and linear electric circuits.

Topic 4. Complex method. Analysis of simple stationary electric circuits with resistive, capacitive and inductive circuits using the complex method

Topic 5. Reconstruction of interconnected electric circuits.

Topic 6. Construction of alternating current circuits and vector diagrams with active inductive and capacitive parallel connections.

Topic 7. Resonance of voltages and currents.

Topic 8. Connecting three-phase electrical circuits connected in the form of a "triangle and star".

Topic 9. Non-sinusoidal current and powerful electrical circuits.

Topic 10. Evaluation of transient processes in electrical circuits with lumped parameters by classical and operator methods.

Topic 11. Evaluation of quadrupoles.

Topic 12. Filters. Determination of the support and graph for a simple electrical filter

Topic 13. Reconstruction of electrical circuits with scattered parameters.

Topic 14. Nonlinear electrical circuits with constant current.

Topic 15. Nonlinear magnetic circuits with constant current.

Topic16. Approximation of nonlinear characteristics.

Topic17. Equivalent sinusoidal method.

Topic18. Periodic processes in nonlinear electric and magnetic circuits.

Topic19. Assignment to calculate nonlinear alternating current electric circuits.

Topic20. Calculation of periodic processes by effective values of nonlinear circuits.

Topic21. Calculation of electric circuits with controlled nonlinear elements.

Topic22. Calculation of transient processes in nonlinear circuits.

Topic23. Electrostatic field.

	Topic24. Image method. Topic25. Calculation of electric capacitance. Topic26. Calculation of the electric field of a constant current. Topic27. Calculating the magnetic field of a constant current IV. Independent learning 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. Calculation of direct current electrical circuits. 2. Calculation of alternating current electrical circuits by symbolic method. 3. Calculation of three-phase electrical circuits. 4. Calculation of quadrupoles by matrix method. 5. Calculation of transient processes in linear electrical circuits by classical method. 6. Calculation of transient processes in linear electrical circuits by operator method. 7. Propagation theorem. Duhamel integral. 8. Calculation of a three-phase alternating current circuit. 9. Calculation of a direct current magnetic circuit. 10. Calculation of a nonlinear alternating current electrical circuit.
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. Charles K. Alexander Matthew N.O. Sadiku —Fundamentals of Electric Circuits‖ NEW YORK, 2014.-458 p				
	2. John Bird. —Electrical and Electronic Principles and Technology‖ LONDON AND NEW YORK, 2014.-455 p				
	3. Karimov A.C. Nazariy elektrotexnika. Darslik. -T: O’qituvchi, 2003. - 422 b.				
	4. Alimxodjayev K.T, Abdullayev V. A. Abidov K.G. Ibodullayev M.I. Elektrotexnikaning nazariy asoslari. Darslik. —Fan va texnologiyalar‖ nashiryoti, Toshkent. 2015, -320 b.				
	5. Karimov A.S. Ibadullayev M.I. Abdullayev B. Elektrotexnikaning nazariy asoslari. 1-qism. Darslik. —Fan va texnologiyalar‖ nashiryoti, Toshkent. 2017, -324 b.				
	6. Alimxodjayev K.T., Abdullayev B. Abidov K.G. Nazariy				

elektrotexnika. 2-qism. Darslik. —Fan va texnologiyalarl nashiryoti, Toshkent. 2018, -288 b.

7. Amirov S.F, Yoqubov M.S, Jabborov N.G. Elektrotexnikaning nazariy asoslari.I- III qismlar-Toshkent; 2007.- 426 b.

8. Amirov S.F, Yaqubov M.S, Jabborov N.G, Sattorov X.A, Balgayev N.E. Elektrotexnikaning nazariy asoslaridan masalalar toplami.-T: Adabiyot uchqunlari, 2015. -420 b.

9. Demirchan K.C, Neyman L.R, Korovkin H.B, hechurin V.L. Teoreticheskie osnovy elektrotexniki. - SPb. Piter, 2003.-462 s.

10. Abidov Q.G, Jorayev R, Ernst I.V, Raxmatullayev A.I. «Elektrotexnikaning nazariy asoslari» fanining «Nochiziqli zanjirlar» bo'limi bo'yicha laboratoriya ishlarini bajarish yuzasidan uslubiy ko'rsatma. TDTU, 2014.- 44 b.

11. Abidov Q.G', Begmatov Sh.E. «Elektrotexnikaning nazariy asoslari» fanidan virtual laboratoriya ishlarini bajarish bo'yicha uslubiy ko'rsatmalar. TDTU, 2013.- 72 b.

12. Abidov Q.G', Raxmatullayev A.L, Jo'rayev R, Ernst I.V, Qadirova. D.R. «Elektrotexnikaning nazariy asoslari» fanining «uch fazali zanjirlar» bo'limi boyicha hisob-grafik ishlarini bajarish yuzasidan uslubiy ko'rsatma. TDTU, 2013.-32 b.

13. Abidov Q.G', Qadirova. D.R. Chiziqli elektr zanjirlarida o'tkinchi jarayonlar » bo'yicha hisob - grafik ishini bajarish yuzasidan uslubiy ko'rsatma. TDTU, 2010.- 36 b.

Additional literature:

14. Mirziyoyev Sh.M. Yangi O'zbekistonda erkin va farovon yashaylik. - T: "TASVIR nashriyoti", - 2021. - 50 b.

15. Mirziyoyev Sh.M. Milliy taraqqiyot yo'limizni qat'iyat bilan davom ettiramiz va uni yangi bosqichga ko'taramiz.-T: "O'zbekiston", 2017-592 b.

16. Mirziyoyev Sh.M. Biz buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – T: O'zbekiston Milliy yangi va eng yangi tarix instituti, 2017. – 488 b.

17. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. T: 2017 yil 7 fevraldagi PF-4947-son qarori.

18. Rashidov Y.R, Abidov IQF, Kolesnikov I.K. «Elektrotexnikaning nazariy asoslari» fanidan 1 -oral iq, 2-oral i q va yakuniy nazorat savollari to'plami. TDTU, 2002.-102 b.

19. Ibadullayev M. Nazariy elektrotexnika asoslari. Masala va mashqlar to'plami.I- qism. T: O'zbekiston, 2015.- 328 b.

20. Korovkin H.B, Selina E.E, Chechurin V.L. Теоретические основы электротехники. Сборник задач. - СПб.ПИТЕР, 2004. -510с.

21. Abidov Q.G, Isamuxamedov S.D, Isamuxamedov U.S. «Elektrotexnikaning nazariy asoslari» fanining «O'zgarmas tok zanjirlari» bo'limi boyicha hisob- grafik ishlarini bajarish namunalari ko'rsatilgan. TDTU, 2010.- 40 b.

22. Abidov Q.G, Isamuxamedov S.D, Isamuxamedov U.S. Elektrotexnikaning nazariy asoslari» fanining «O'zgarmas tok zanjirlari» bo'limi bo'yicha hisob- grafik ishlari, Elektrotexnikaning nazariy asoslari fanining «O'zgaruvchan tok zanjirlari» bo'limi bo'yicha hisob-grafik ishlarini bajarish yuzasidan uslubiy ko'rsatma. TDTU, 2010.-31 b.

23. Abidov Q.G, Ernst I.V. «Elektrotexnikaning nazariy asoslari» fanining «Nochiziqli magnit zanjirlarini hisoblash» bo'limi bo'yicha hisob-grafik ishi bajarish yuzasidan uslubiy ko'rsatma. TDTU, 2010.- 32 b.

24. Abidov Q.G, Rashidov Y.R. Isamuxamedov S.D. Elektrotexnikani nazariy asoslari fanidan laboratoriya ishlari bajarish uchun uslubiy ko'rsatma 1-qism. TDTU, 2007.-38 b.

25. Abidov Q.G', Rashidov Y.R, Isamuxamedov S.D. Elektrotexnikani

nazariy asoslari fanidan laboratoriya ishlari bajarish uchun uslubiy ko'rsatma 2- qism. TDTU, 2007. 46 b.

Internet resources:

18. www.gov.uz - Government portal of the Republic of Uzbekistan.
www.lex.uz - National database of legislative documents of the Republic of Uzbekistan.

19. www.prezident.uz - Press service of the President of the Republic of Uzbekistan. www.scopus.com - international scientific database.

20. www.ziyonet.uz – national educational materials search site.

21. www.gov.uz – Government portal of the Republic of Uzbekistan.

22. www.google.com – international educational materials search site.

23. www.energystrategy.ru – “Energy Policy and Strategy” information portal

24. www.twirpx.com – international educational materials search site.

Name of subject	Thermal Engineering and Hydropower (ECTS 11)
Subject/module code	ITG12310
Science taught semester (s).	2 nd and 3 rd semesters
Responsible teacher	Baratov Laziz, assistant.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 330 . Audience Training hours - 132. Lecture hours - 48 Laboratory hours - 36 Practical hours - 48 Independent education - 198 hours
ECTS	11
The purpose and tasks of subject / learning outcomes	The goal of teaching science is to develop knowledge, skills, and competencies in non-energy fields in each student studying in these areas, appropriate to the profile of the field, in terms of the laws of thermodynamics, types of heat engines, their structure, operation in cycles, and thermodynamic processes and heat transfer that occur in them. The task of the subject is to teach students the theory of the operation of heat engines, the laws of energy circulation, cycles and structure of energy devices, the processes that occur in them, as well as heat transfer and the principles of operation of thermal energy devices. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the laws of thermodynamics. 3. Study the types, structure, and operation of heat engines in cycles. 4. Study the laws of energy circulation in power plants. 5. Heat transfer and the principle of operation of heat power plants.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Introduction to the subject of “Heat Engineering and Hydropower”. History and development trends of thermodynamics and heat engineering Topic 2: Heat capacity. Molecular-kinetic theory of heat capacity of gases. Topic 3: Law of conservation and circulation of energy. Amount of work and heat in a thermodynamic process. I-th law of thermodynamics. Topic 4: Analysis of basic thermodynamic processes. Topic 5: Isobar, isochoric, isothermal, adiabatic and polytropic processes. Topic 6: Definitions of the II-th law of thermodynamics. Direct and inverse periodicity. Thermal efficiency of a heat device Topic 7: Water vapor and its properties. H-s diagram of water vapor Topic 8: Steam turbine devices. Rankine cycle. Cycles of a steam turbine device. Topic 9: Gas turbine device. Cycles of a gas turbine device. Topic 10: Fundamentals of heat transfer. Basic concepts. Heat transfer methods: heat conduction, convective heat transfer, radiation. Heat transfer. Topic 11: Fundamentals of convective heat transfer. Convective heat transfer Topic 12: Heat transfer. Heat transfer of a single and multi-layer flat wall under the boundary condition of the third order. Topic 13: Basic laws of heat transfer by radiation.

Topic 14: Heat exchange devices. Types of heat exchange devices. Recuperative, regenerative and mixed heat exchange devices.

Topic 15: Compressors, their types, structure and operating methods

II. Instructions and recommendations for organizing laboratory exercises.

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

Recommended topics for laboratory work:

1. Pressure and temperature measuring instruments;
2. Verification of the Boyle-Mariotte law;
3. Determination of the mass heat capacity of air;
4. Determination of the thermal conductivity of an insulating material;
5. Determination of the thermal conductivity of a horizontal pipe;
6. Operation of a single-stage piston compressor;

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with the study of 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 training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of a practical training is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

Recommended practical topics:

1. State parameters and equation of state;
2. Heat capacity
3. Isobar, isochoric, isothermal processes,
4. Adiabatic and polytropic processes;
5. Carnot cycle
6. Steam turbine device. Rankine cycle.
7. Heat transfer.
8. Heat exchangers.

IV. Independent learning 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.

Independent study for recommended topics:

1. Ideal gas equation of state
2. Ideal gas mixtures
3. Heat capacity of ideal gases
4. I-law of thermodynamics
5. Isobaric, isochoric, isothermal, adiabatic and polytropic processes
6. II-law of thermodynamics
7. Cyclic processes. Carnot cycle
8. Heat conductivity of a flat wall and a cylindrical wall
9. Heat transfer
10. Laws of radiation.
10. Heat exchangers.
11. Gas turbine devices.

	12. Compressor devices.
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. S. Kleein., G.Nellis. Thermodynamics. Cambridge, 2012 2. Alimova M.M., Mavjudova Sh.S., Isaxodjayev X.S., Raximjonov R.T., Umarjonova F.Sh. «Issiqlik texnikasining nazariy asoslari» fanidan tajriba ishlari to'plami. Uslubiy qo'llanma, 1-qism.-T.: Toshkent, ToshDTU, 2006. 3. Koroli M.A., Umarjonova F. Sh., Xoshimova F.A. Termodinamika. Issiqlik texnikasi. darslik. - Toshkent: BOOK TRADE KO, 2022 4. Mavjudova Sh.S. Termodinamika va issiqlik texnikasi. Darslik, – Toshkent.: Fan va texnologiyalar nashriyoti-matba uyi, 2022 5. Mavjudova Sh. S. Issiqlik texnikasi, O'quv qo'llanma.-Toshkent: O'zbekiston faylasuflari milliy jamiyati nashriyoti, 2023. 6. Umarjonova F. Sh., Isaxodjaev X. S., Mavjudova Sh. S., Alimova L.O., Axmatova S. R. “Issiqlik texnikasi” fanidan laboratoriya ishlari to'plami. Uslubiy qo'llanma. – Toshkent, ToshDTU. 2014-94 b. 7. Uzoqov G'.N., Qodirov I.N., Isaxodjaev X.S.. Termodinamika. O'quv qo'llanma -Toshkent: Voris- Nashiriyot, 2018. 8. Zohidov R.A., Alimova M.M., Mavjudova SH.S. Texnik termodinamika va issiqlik uzatilishi fanidan masalalar to'plami. – Toshkent.: TDTU, 2006. Additional literature 1. Mirziyoyev Sh.M. Yangi O'zbekiston taraqqiyot strategiyasi. 2-to'ldirilgan nashr. – T.: O'zbekiston, 2022. – 44 b. 2. Islom Karimov nomidagi Toshkent davlat texnika universiteti talabalari mustaqil ta'limni tashkil etish bo'yicha Tartibi. – T.: ToshDTU, 10.06.2024. – 6 b. 3. В.П.Белоглазов. Теоретические основы теплотехники. Теплопередача. Нижневартовск, 2016 4. А.А.Яновский. Теплотехника. Уч. пособие. Ставрополь. 2020 5. Koroli M.A., Mavjudova SH.S. Zamonaviy pedagogik texnologiyalar. Metodik ishlanma. -Tashkent.: TDTU, 2003. Internet sources: 16. www.ziyonet.uz – milliy o'quv materiallarini qidiruv sayti.				

	17. www.gov.uz – O‘zbekiston Respublikasining hukumat portali. 17. www.google.com – xalqaro o‘quv materiallarini qidiruv sayti. 19. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali 20. www.twirpx.com – xalqaro o‘quv materiallarini qidiruv sayti.

Name of subject	Introduction to the Specialty (ECTS 6)
Subject/module code	YK1106
Science taught semester (s).	1 st semester
Responsible teacher	Khasanov Mansur Yusup ugli, assistant teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-180. Audience Training hours - 72 Lecture training hour – 24 Practical training hour – 48 Independent education -108 hours
ECTS	6
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to provide students with an understanding of the unique characteristics of the energy sector, key concepts related to the field, processes of electricity generation, and fundamental introductory knowledge about the energy industry. The objective of the subject is to teach the basic concepts of energy sources, electricity generation, transmission and distribution, as well as to provide initial knowledge on designing power supply systems for electricity consumers and to introduce the specific features of using both conventional and non-conventional energy sources. Learning outcomes: 1. Students should have knowledge about the generation of electrical energy at power stations, as well as its transmission and distribution to consumers. 2. Students should understand the role of the power supply system within the overall energy system. 3. Students should have knowledge of energy sources, their types, characteristics, and areas of application. 4. Students must know the basic laws of electrical circuits. 5. Students should understand the main concepts in the energy field, the principles of designing consumer power supply systems, and the specific features of using conventional and non-conventional energy sources, as well as how to utilize them effectively. 6. Students will be able to determine electrical circuit parameters using Coulomb's, Faraday's, Ohm's, Joule–Lenz's, and Kirchhoff's laws through calculation and analysis. 7. Students will be able to study and analyze existing problems in providing consumers with uninterrupted and high-quality electrical energy, and propose preliminary solutions to those problems. 8. Students will be able to calculate current, voltage, electrical energy, efficiency (COP), and resistance of series and parallel capacitors in direct and alternating current circuits.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1. The Role of Energy in Uzbekistan and Prospects for the Development of the Electric Power Sector. Topic 2. The Role of Energy in Technological Progress Topic 3. Processes of Utilizing Energy Resources Topic 4. Non-Renewable Energy Sources Topic 5. Unconventional Renewable Energy Sources Topic 6. Thermal Power Plant and Combined Heat and Power Plant (TPP and CHP) Topic 7. Nuclear Power Plant (NPP) and Hydroelectric Power Plant (HPP) Topic 8. Solar Power Plants (SPP)

Topic 9. Wind Power Plants (WPP)

Topic 10. The Electric Power Sector and Energy System

Topic 11. Electric Motors and Generators

Topic 12. Energy and the Environment.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Coulomb's Law and Problem Solving Related to It
2. Faraday's Law and Problem Solving Related to It
3. Parallel and Series Connections of Capacitors and Problem Solving Related to It. Parallel and Series Connections of Solar Modules and Problem Solving Related to It
4. Ohm's Law for a Part of an Electric Circuit and Problem Solving Related to It
5. Ohm's Law for the Entire Circuit and Problem Solving Related to It
6. Electric Current in DC Circuits and Problem Solving Related to It
7. Voltage in DC Circuits and Problem Solving Related to It
8. Electric Conductors and Problem Solving Related to It
9. Parallel and Series Connections of Resistors and Problem Solving Related to It. Parallel and Series Connections of Motors and Problem Solving Related to It
10. Kirchhoff's First Law and Problem Solving Related to It
11. Kirchhoff's Second Law and Problem Solving Related to It
12. Joule–Lenz Law and Problem Solving Related to It
13. Law of Electromagnetic Induction and Problem Solving Related to It
14. Electric Current, Electrical Power, and Efficiency (COP) and Problem Solving Related to It.
15. Alternating Current Circuits and Problem Solving Related to It

III. Independent learning 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. Prospects for the Development of the Electric Power Sector in Uzbekistan
4. The Role of Energy in Technological Progress
5. Processes of Utilizing Energy Resources
6. Coal, Oil, Natural Gas, and Nuclear Energy Reserves
7. Wind and Solar Energy Reserves
8. Hydropower Reserves
9. Energy Reserves from Tidal (Sea Wave) Movements and Other Sources

	10. Operating Principles of TPPs, CHPPs, HPPs, SPPs, WPPs, and NPPs (<i>TPP – Thermal Power Plant, CHPP – Combined Heat and Power Plant, HPP – Hydroelectric Power Plant, SPP – Solar Power Plant, WPP – Wind Power Plant, NPP – Nuclear Power Plant</i>) 11. Overview of Existing HPPs and TPPs in Uzbekistan 12. Operating Principle of Pumped Storage Hydroelectric Power Plants (PSHPPs) 13. Operating Principle of MHD Generators (Magnetohydrodynamic Generators) 14. Electric Power Sector 15. Use of Electric Energy in the National Economy 16. Energy System 17. Electric Motors and Generators 18. Energy and the Environment 19. Coulomb's Law 20. Faraday's Law of Electromagnetic Induction 21. Ohm's Law for a Part of an Electric Circuit 22. Ohm's Law for the Whole Circuit 23. Electric Current and Voltage in DC Circuits 24. Kirchhoff's First Law 25. Kirchhoff's Second Law 26. Processes of Generation, Transmission, Distribution, and Consumption of Electric Energy 27. Electrical Conductors and Their Series and Parallel Connections 28. Understanding Current, Electric Power, and Efficiency (COP) 29. Alternating Current Electrical Circuits 30. Transformers and Their Operating Principles
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. Mulukutla S. Sarma. Introduction to Electrical Engineering. 2001, Oxford University Press. - 869 p. (The Oxford series in electrical and computer engineering) 2. Karimov R.Ch., Rafiqova G.R., Usmonov E.G., Ro‘zinazarov M.R. Yo‘nalishga kirish. Ma‘ruzalar matni. –T.: ToshDTU nashriyoti. 2018. 3. Qodirov T.M., Alimov H.A. «Sanoat korxonalarining elektr ta‘minoti». O‘quv qo‘llanma. –T.: ToshDTU bosmaxonasi. 2006.						

4. Majidov T.Sh. Noan'anaviy va qayta tiklanuvchi energiya manbalari, O'quv qo'llanma. –T.: 2014.
5. Taslimov A.D., Rasulov A.N., Usmonov E.G. Elektr ta'minoti. O'quv qo'llanma. –T.: «Ilm ziyo» nashriyoti. 2012.
6. Majidov T.Sh. Noan'anaviy va qayta tiklanuvchi energiya manbalari // Toshkent. 2014.
7. John Twidell and Tony Weir. Renewable Energy Resources // Taylor and Francis Group. LONDON AND NEW YORK, 2006.
8. Renewable Energy // ICAR e-Course For B.Sc (Agriculture) and B.Tech (Agriculture)
9. Majidov T.Sh. Noan'anaviy va qayta tiklanuvchi energiya manbalari // Toshkent. 2014.
10. John Twidell and Tony Weir. Renewable Energy Resources // Taylor and Francis Group. LONDON AND NEW YORK, 2006.

Additional literature:

11. Mirziyoev SH.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. - T.: "O'zbekiston" NMIU, 2017. – 488 b.
12. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.
13. O'zbekiston Respublikasini «Energiyadan ratsional foydalanish haqidagi» qonuni 29 aprel 1997yil.
14. Афанасев В. П., Теруков Э. И., Шерченков А. А Тонкопленочные солнечные элементы на основе кремния // Санкт-Петербург. Издательство СПбГЕТУ «ЛЕТИ» 2011.

Internet resources:

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

Name of subject	Power supply of industrial enterprises (ECTS 10)
Subject/module code	SKET16710
Science taught semester (s).	6 th and 7 th semester
Responsible teacher	Kurbanov Abror, assistant.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-300. Audience Training hours - 120. Lecture training hour – 60 Laboratory training hour – 30 Practical training hour – 30 Independent education -180 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to teach students how to determine the cartogram of electrical loads and the conditional center of loads, select the number and power of power transformers at substations, use renewable energy sources in the power supply system of industrial enterprises, quality indicators of electrical energy, select cross-sectional areas of overhead and cable lines, short circuits in the power supply system, select electrical equipment, and automatic reactive power adjustment schemes in the power supply system of industrial enterprises. The task of the subject is to help students build and select power supply schemes for industrial enterprises, analyze reactive power compensation issues, create a load map and determine the location of the main step-down substation, determine the cross-sectional areas of overhead and cable lines, and develop their professional competencies in the construction and design of power supply for industrial enterprises. Learning outcomes: 1. Know the classification of electricity consumers and their types; 2. Fully master the analysis of power quality issues; 3. Know the graph of electrical loads and the calculation of electrical loads; 4. Have the skills to calculate shop electrical networks and draw up system diagrams; 5. Must fully master the theoretical foundations of the methods for selecting power transformers; 6. Know the methods for selecting the cross-sections of conductors and cable cores; 7. Have information on compensating for the reactive power deficit in the power supply system of industrial enterprises.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. History of development of energy in Uzbekistan, current state and prospects. Topic 2: Grouping of consumers of electric energy of industrial enterprises. Topic 3: Consumers of electric energy of industrial enterprises. Topic 4: Electric load graphs of industrial enterprises and consumers. Topic 5: Main quantities characterizing electric load graphs. Topic 6: Design load in the power supply system and characteristic points for its determination. Topic 7: Methods for determining the design load in the power supply system. Topic 8: Method of regulated diagrams of design load. Topic 9: Schemes of shop networks with voltage up to 1000V. Topic 10: Protection of shop networks.

Topic 11: Issues of compensation of reactive power in the power supply system of industrial enterprises.

Topic 12: Reactive power sources.

Topic 13: Cartogram of electrical loads and determination of the conditional center of loads.

Topic 14: Selection of the number and power of power transformers at substations.

Topic 15: Use of renewable energy sources in the power supply system of industrial enterprises.

Topic 16: Quality indicators of electric energy.

Topic 17: Asymmetry and non-sinusoidality of current and voltage waveforms

Topic 18: Power supply schemes of industrial enterprises. External and internal schemes.

Topic 19: Selection of cross-sectional areas of overhead and cable lines.

Topic 20: Selection of a cable line according to the condition of thermal resistance of short-circuit current.

Topic 21: Short circuit in a power supply system. Calculation of short-circuit currents.

Topic 22: Selection of electrical equipment.

Topic 23: Selection of electrical equipment for internal and external power supply systems.

Topic 24: Automatic reactive power adjustment schemes in the power supply system of industrial enterprises.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies in various indicators of power supply processes of industrial enterprises, conducting experiments, calculating and drawing tables and graphs. The proposed topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Study of electrical load graphs of industrial enterprises.
2. Study of automatic transfer switch (AVR) schemes of the reserve source.
3. Study of schemes of step-down substations of industrial enterprises.
4. Determination of the asymmetry coefficient of voltage and the displacement voltage of the neutral point.
5. Checking non-sinusoidal modes in the electrical networks of industrial enterprises and cities.
6. Symmetry of asymmetry loads of a three-phase network.
7. Compensation of reactive power.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

	1. Calculation of the quantities characterizing the electrical load graphs. 2. Calculation of the design load using the main and auxiliary methods. 3. Determination of the amount of reactive power to be compensated. 4. Construction of a cartogram of electrical loads and determination of the installation location of the BPP. 5. Selection of the number and power of transformers. 6. Calculation of the power of renewable energy sources in the power supply system of the enterprise workshop. 7. Calculation of deviations and fluctuations of the quality indicators of electrical energy. 8. Calculation and selection of cross-sectional areas of overhead and cable lines. 9. Calculation of grounding devices. 10. Calculation and selection of parameters of electrical appliances. IV. Independent learning 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. General issues of power supply of industrial enterprises. 2. Quality indicators of electric energy. 3. Methods of determining electrical load graphs. 4. Power supply schemes of industrial enterprises. 5. Selection of power transformers. 6. Selection of voltage in the power supply system of industrial enterprises. 7. Methods of selecting transmission cables. 8. Selection of electrical appliances, insulators and current-carrying parts (based on short-circuit current). 9. Issues of reactive power compensation.
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. Steven W.Blume. Electric Power System Basics. USA.: Wiley – Interscience A John Wiley&Sous, INC Publication, 2007, 260 p 2. Липкин Б.Ю., "Электроснабжение промышленных предприятий и установок", Учебник. -М.: "Высшая школа", 1980. 3. Кудрин Б.И., Электроснабжения промышленных предприятий. Учебник. -М.: Интермет Инжиниринг, 2005. 4. Qodirov T.M., Alimov X.A., «Sanoat korxonalarining elektr ta'minoti», O'quv qo'llanma,ToshDTU. –T.:2006. 5. Qodirov T.M., Alimov X.A., Rafiqova G.R., Sanoat korxonalari va fuqoro binolarining elektr ta'minoti. O'quv qo'llanma. ToshDTU. – T.:2007. 6. Taslimov A.D., Rasulov A.N., Usmonov E.G., Elektr ta'minoti. O'quv qo'llanma. Ilm-ziyo. –T.:2012 Additional literature: 7. O'zbekiston Respublikasining yanada rivojlantirish bo'yicha Xarakatlar strategiyasi to'g'risida.-T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 8. Конюхова Е.А., Электроснабжение объектов: Учебное пособие. -М.: Издательство «Мастерство»; Высшая школа, 2001. 9. Ополева Г.Н., Схемы и подстанции электроснабжения: Справочник: Учебное пособие. - М.: ФОРУМ: ИНФРА-М, 2006. 10. Гулямов Б.Х., Салиев А.Г., Ташпулатов Б.Т., Тешабаев Б.М., Правила устройства электроустановок. Узгосэнергонадзор. -Т.: 2007. 11. Аллаев К.Р., Энергетика мира и Узбекистана. Аналитический обзор. -Т.: Издательство «Молия», 2007. 12. Аллаев К.Р., Электроэнергетика Узбекистана и мира. -Т.: «Фан ва технология», 2009. Internet resources: 13. www.ziynet.uz – national educational materials search site. 14. www.gov.uz – Government portal of the Republic of Uzbekistan. 15. www.google.com – international educational materials search site. 16. www.energystrategy.ru – “Energy Policy and Strategy” information portal 17. www.twirpx.com – international educational materials search site.

Name of subject	Urban electricity supply (ECTS 9)
Subject/module code	SHET16709
Science taught semester (s).	6 th and 7 th semester
Responsible teacher	Boliev Alisher Mardievich, assistant.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-270. Audience Training hours - 108. Lecture training hour – 60 Laboratory training hour – 24 Practical training hour – 24 Independent education -162 hours
ECTS	9
The purpose and tasks of subject / learning outcomes	The purpose of teaching science This program on the subject of "Urban Electricity Supply" is based on the established state educational standard and qualification requirements and the approved subject program. In our republic, great attention is paid to the training of qualified energy specialists in the context of further deepening economic reforms and the development of market relations. This program includes information about electricity consumers, electrical equipment and base substations, urban electrical equipment, and lighting in the urban power supply system. This subject includes information about electricity consumers, electrical equipment and base substations, urban electrical equipment, and lighting in the urban power supply system. The task of subject is to teach the basics of urban power supply, their schemes, methods for optimizing the operation of electricity consumers. To teach urban power supply schemes and familiarize with the electrical systems of cities. Lectures on topics in the theoretical part are structured in accordance with the content of the module. To achieve this goal, the subject performs the tasks of providing students with theoretical knowledge, practical skills, a methodological approach to phenomena and processes, and the formation of a scientific worldview. Learning outcomes: 1. The introductory course on urban power supply studies the development, history and prospects of the electric power system. 2. The role and socio-economic significance of electricity in society. 3. State policy in the energy sector and its development trends and prospects in the country and the world. 4. Basic concepts in the electric power sector. 5. Main performance indicators for various types of transport and opportunities for their improvement. 6. Improving the efficiency of electric power generation equipment. 7. Economic assessment of the competitiveness of traditional and unconventional methods of electric power generation.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction Information about the city's electricity supply system and consumers. The role of the city electricity supply industry in the transition of the Republic of Uzbekistan to a "green" economy. Topic 2: Structure of power lines. General information about overhead lines. Wires and cables of overhead lines. Supports of overhead lines. Function of all-important equipment in power distribution networks. Topic 3: Brief description of cities. Classification of cities and settlements by population. Social and

communal facilities in the largest and largest cities. Zones of the territory of the settlement. Common electrical receivers and electrical consumers in houses. Household appliances. Cultural and household appliances. Sanitary and hygienic equipment. Common electrical consumers in houses.

Topic 4: Reliability of urban electricity consumers

Requirements for the reliability of electricity supply to residential and public buildings. Grouping of urban electricity consumers by reliability. General information about elevator installations. Complex of buildings and structures in the city.

Topic 5: Determining electrical loads in the city's power supply system.

Topic 6: City electrical loads and consumption. Calculation of electrical loads. All groups of city electrical energy consumers. Load graphs of city electrical networks and consumers. Estimated electrical load of residential electrical energy consumers. Estimated load on the line or TP bus.

Topic 7: Determination of design loads of residential and public buildings. Electrical energy receivers of residential and public buildings. Design load of residential and public buildings. Determination of design loads of residential buildings. Determination of design loads of public buildings.

Topic 8: Schemes of supply and distribution power networks.

Schemes of supply power networks. Rules for developing supply power network schemes in large cities. Schemes of distribution power networks. Radial and trunk power network schemes. Schemes of external power supply of residential and public buildings.

Topic 9: Internal power supply schemes. Input distribution devices and schemes. Basic schemes of residential electrical networks. Structural scheme of the electrical network of buildings. Internal schemes of execution of urban electrical networks and requirements for them.

Topic 10: Voltage selection in the urban power supply system

Establishment of a standard voltage scale. Nominal voltages of electrical networks, consumers and alternating current sources. Nominal phase voltages of three-phase current and the highest operating voltage above them.

Topic 11: Basic rules for selecting power transmission line voltage. Basic rules to consider when selecting power transmission line voltage. The task of selecting voltage in a power supply system. Selecting the optimal voltage value.

Topic 12: Voltage selection in distribution networks Selection of nominal voltage for supply power networks. Selection of nominal voltage for distribution power networks. Costs involved in voltage selection. Selection of optimal voltage for a 10 kV power network. Selection of optimal voltage for an internal power network up to 1 kV.

Topic 13: Selection of cable lines in the city power supply system.

Topic 14: General characteristics of cables, cables and their types. Underground and overhead cable lines. Low-pressure oil cables of various brands. Parameters of oil-filled high-pressure cables. Technical and economic indicators of cables. Capital costs for cables, operating costs. Level of power loss in cable lines.

Topic 15: Cable lines with voltages of 35-110-220 kV

Cable lines with voltages of 35 kV and their application. Cable lines with voltages of 110 kV and their application. Cable lines with voltages of 220 kV and recommendations for their application. Advantages and disadvantages of high-voltage cables. Location and dimensions of cables in trays.

Topic 16: Selection of the cross-sectional area of cables for power networks with voltages up to 1 kV and 6-10 kV. Cable lines for power

networks with voltages up to 1000 V. Cable lines with voltages of 6-10 kV. Conditions for selecting the cross-sectional area of cable lines. Selection of the cross-sectional area of cable lines according to the economic current density. Selection of cable lines according to the thermal resistance of the short-circuit current.

Topic 17: Transformer substations of the city's power supply system.

Topic 18: Connection of step-down substations to electrical networks. Transformers and substations used in urban electrical networks. Technical and economic indicators of transformers. Types of connection of substations to the network. Typical schemes of substations with different nominal voltages.

Topic 19: Transformer substations with voltages of 35-500/6-10 kV. Technical and economic models of substations. Location and dimensions of substations. Capital costs. Operating costs. General structure of the substation building. Power and energy losses in transformers.

Topic 20: Selection of the number and power of transformers in 10/0.4 kV substations. Transformers in 10/0.4 kV substations. Location of substations in the design of internal networks. Selection of the number and power of transformers in 10/0.4 kV substations in the urban power supply system. Technical data of transformers for complete transformer substations.

Topic 21: Protective devices for residential and public buildings in the city power supply system.

Topic 22: Protective devices for residential and public buildings. Abnormal situations that may occur in the city power supply system. Protective devices for residential and public buildings: fuses and circuit breakers. Control panel diagrams of switching devices used in distribution electrical networks up to 1000 V.

Topic 23: Circuit breakers. Ensuring selectivity in the use of circuit breakers. Circuit breakers in residential and public buildings. Basic circuit breakers. Types of circuit breakers according to operating conditions. Factors affecting selectivity in radial power supply schemes. Network protection with switching and protective devices.

Topic 24: Optimization of urban power supply system parameters.

Topic 25: Basic rules for parameter optimization Comparison of network parameters for optimal construction of a city power supply system. Optimization of individual elements of the system. Costs given to minimize capital costs. Annual depreciation rates. Costs given and related coefficients.

Topic 26: Optimization of parameters and analysis of technical and economic indicators. Optimization of parameters of urban electricity supply. Analysis of technical and economic indicators by parameters. Criteria for costs by technical and economic indicators.

Topic 27: Optimization of the urban power supply system
Systematic optimization of the urban power supply system according to network parameters. Optimization according to the length and cross-sectional area of the existing lines in the city. Optimization according to the number of outgoing lines, the number and power of transformer substations.

Topic 28: Optimization and methods of urban power supply parameters.

Topic 29: Accounting and control of electricity in the urban power supply system History of the accounting and control system of electricity. Accounting for electricity consumption in elements of urban power networks. Power and electrical energy waste in power networks. About the history of the accounting and control system of electricity.

Topic 30: Automated system for accounting and control of electricity.

Structural elements of the automated system for accounting and control of electricity in urban power supply. Technical means of the automated system for accounting and control of electricity. Software tools of the automated system for accounting and control of electricity.

II. Instructions and recommendations for organizing laboratory exercises.

During laboratory work, students will develop practical skills in urban power supply schemes, loads, and electricity quality indicators.

Suggested topics for laboratory work:

1. Construction of load charts for urban electricity consumers.
2. Research on urban power supply schemes.
3. Checking non-sinusoidal modes in urban power grids.
4. Study of the procedure for symmetrizing asymmetrical loads of a three-phase network in cities.
5. Study of schemes of step-down substations in cities.
6. Study of protective devices for residential and public buildings in the city power supply system.
7. Study of schemes for automatically connecting a reserve source in urban electrical networks.
8. Selection of cross-sectional area of cables for urban power networks.
9. Parameter optimization and analysis of technical and economic indicators.
10. Accounting and control of electrical energy in the city's power supply system.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

Recommended practice topics:

1. Calculation of loads of urban electricity consumers.
2. Selection of urban power supply schemes.
3. Voltage selection for urban power supply systems.
4. Selection of cross-sectional area of cables for urban power networks.
5. Determining the installation location of the BPP and calculating the electrical load map.
6. Selection of the number and capacity of transformers in substations.
7. Calculation of short-circuit currents in the urban power supply system.
8. Selection of protective devices for residential and public buildings in the city power supply system.
9. Optimization of the city's power supply system.
10. Accounting and control of electricity in the city's power supply system.
11. Analyze the role of urban networks in the urban power supply system.
12. Optimization of the urban power supply system and its analysis results.

IV. Instructions and recommendations for coursework.

The coursework develops the skills of creative independent work, forms

	in students the skills of calculating and selecting elements of the power supply system of cities. Each student is given an individual assignment. Approximate topics of the coursework: 1. Electrical loads of urban electricity consumers (residential, commercial and public buildings). 2. Selection of cross-sectional areas of cable lines. 3. Calculation of the location and power of transformer substations. 4. Selection of a power supply scheme for a microdistrict or district. 5. Calculation of short-circuit currents and selection of switching equipment. V. Independent learning 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. Independent study for recommended topics: 1. Determination of calculated electrical loads in urban networks. 2. Construction of 6-10 kV supply networks. 3. Construction of building electrical network schemes. 4. Electrical network distribution schemes in residential buildings. 5. Internal electrical energy distribution schemes in public buildings. 6. Optimization of parameters of urban electrical networks and analysis of technical and economic indicators. 7. Technical and economic indicators of transformers and small urban substations. 8. Rational distance for transmitting electrical energy at a voltage of 6-10 kV in the urban power supply system. 9. Determination of power and electrical energy waste in urban power networks. 10. Accounting and control of electrical energy in urban power networks. 11. Optimization of the urban power supply system. 12. Selection of the cross-sectional area of cables in urban power networks 13. The current state of accounting and control of electricity in the urban power supply system.
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. Steven W.Blume. Electric Power System Basics. USA. Wiley – Interscience A John Wiley&Sous, INC Publication, 2007, 260 p. 2. Saidkhodjayev A.G. Urban electricity supply. Textbook. – T.: Fan-tekhnologiya, 2015. 3. Козлов В.А. Электроснабжение городов.Учебник. -Л.: «Энергоатомиздат», 1988г. -263с. 4. Ополева Г.Н. Схемы и подстанции электроснабжения: Справочник: Учебное пособие. – М.: ФОРУМ: ИНФРА-М, 2006. – 480 с. 5. Тульчин И.К. Нудлер Г.И. «Электрические сети жилых и общественных зданий». – М.: Энергоатомиздат, 1999. Additional literature: 6. Mirziyoyev Sh.M. Development Strategy of New Uzbekistan. 2nd supplemented edition. – T.: Uzbekistan, 2022. – 44 p. 7. Соколова Е.М. Электрическое и электромеханическое оборудование: общепромышленные механизмы и бытовая техника, - М.: Изд «Мастерство» 2001. 8. Конюхова Е.А. Электроснабжение объектов: Учебное пособие. -М: Изд «Мастерство», 2001. Internet resources: 9. www.gov.uz – Government portal of the Republic of Uzbekistan. 10. www.catback.ru – International scientific articles and educational materials website. 11. www.google.ru – International educational materials search website. 12. www.ziyonet.uz – National educational materials search website. 13. www.lex.uz – National database of legislative documents UzRes.

Name of subject	Energy management (ECTS 10)
Subject/module code	EMEN14510
Science taught semester (s).	3 rd and 4 th semesters
Responsible teacher	Olimov Orif Nosirovich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 300 . Audience Training hours - 120. Lecture training hour - 60 Laboratory training hour - 30 Practical training hour - 30 Independent education - 180 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject The purpose of the course is to teach students the parameters and conditions of Energy Management, to master the methods of calculating and analyzing the conditions of electrical networks and systems, to teach the basics of designing electrical systems, to teach measures to increase the efficiency of electrical networks, and to acquaint them with the main parts of electrical networks and mechanical electrical networks. their calculation. The task of the subject Students will build switching circuits of electrical network elements and determine their parameters, calculate the electrical states of open and closed electrical networks of varying complexity, study the characteristic operating states of electrical networks and systems and evaluate them, learn to control and adjust in electrical networks and systems; to teach the main criteria for designing electrical networks, improving and ensuring the efficiency of electrical networks. Learning outcomes: 1. The concept and structure of energy management 2. The importance of how to form an energy passport 3. General information on energy saving. 4. Types of energy waste in the power supply system and their connection. 5. Forecasting and standardization of electricity consumption. 6. Fundamentals of energy audit. 7. Energy monitoring. 8. Knowledge of the main legal and regulatory documents in the field and their use 9. Activities of energy services. 10. Energy management of investments in energy saving. 11. Measures to increase and popularize energy efficiency and marketing support. 12. Technical and economic energy efficiency of energy saving measures.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of science. Concept and structure of energy management. Energy management as a special type of management activity Topic 2: Energy resources of industrial enterprises: Types and classification. Topic 3: ISO-50001 international energy management standard. ISO-50001 - International standard. ISO-50001 software manual. Topic 4: General information on energy waste. Types of energy waste. Topic 5: General information on energy waste. Types of energy waste. Topic 6: Measures to reduce energy waste in the power supply system.. Topic 7: General information on regulating electricity consumption. General information on forecasting electricity consumption Topic 8 Types of regulating electricity consumption. Topic 9: Types of electricity consumption forecasting

Topic 10: Energy audit and structure. Energy balance and its types

Topic 11: Provision of energy audit services. Instrumental inspection

Topic 12: Energy monitoring of calculations.

Topic 13: Stages of energy monitoring. Stages of energy monitoring and verification of indicators..

Topic 14: Acceptance of energy services. Public-Private Partnership services.

Topic 15: Features of energy supply contracts with energy services.

Topic 16: Fundamentals of project management.

Topic 17: Management of changes in energy efficiency. Risks of starting energy efficiency.

Topic 18: Promotion of energy efficiency in industrial enterprises. Motivation of employees in the field of energy efficiency.

Topic 19: Information and marketing management of energy management.

Orientation of services in the field of energy efficiency and energy efficiency.

Topic 20: Efficiency indicators of energy saving projects.

Practice of evaluating energy saving projects.

Topic 21: Fundamentals of assessing the technical and economic efficiency of energy saving measures.

II. Instructions and recommendations for organizing laboratory exercises.

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

Recommended topics for laboratory work:

1. Study of the working process of devices for measuring the flux density of solar radiation;
2. Study of the structure and operation of the luxmeter RS 180-7133;
3. Study of the working process of a thermal imager;
4. The principle of operation of a motion sensor and analysis of types of motion sensors;
5. Schemes of motion sensors and their principle of operation, connection schemes;
6. Study of the working process of a small paraboloid-type solar concentrator;
7. Determination of the temperature at the focus of a small paraboloid-type solar concentrator with a diameter of 80 cm;
8. Study of the temperature regimes of a solar photovoltaic module;
9. Study of the working process of active solar water heaters;
- 10 Study of the working process of active solar water heaters;
11. Fundamentals of investment project management and management of project changes in energy efficiency.;
12. Study of information and marketing management of energy management and economic assessment of energy efficiency.

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 electrical energy management processes. The proposed topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

- 1 Calculation of energy indicators in the formation of energy management.
2. Calculation of electricity consumed by consumers at established prices.
3. Calculation of power and energy waste in the power supply system.
4. Calculation of standard indicators of electricity at industrial enterprises.
5. Calculation of forecast indicators of electricity consumed in the future.
6. Calculation of waste when conducting audits at industrial enterprises.

- 7 Calculation of energy indicators in the formation of energy passports of industrial enterprises and buildings.
8. Calculation of energy indicators in energy monitoring at industrial enterprises.
9. Formation of energy service at industrial enterprises
10. Calculation of electricity waste.
11. Calculation of energy savings through the use of non-traditional energy sources in the energy supply of consumers.
12. Definitions and prices in energy. Cal

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation of energy indicators in the formation of energy management.
2. Calculation of electricity consumed by consumers at established prices.
3. Calculation of power and energy waste in the power supply system.
4. Calculation of standard indicators of electricity at industrial enterprises.
5. Calculation of forecast indicators of electricity consumption in the future.
6. Calculation of waste when conducting audits at industrial enterprises.
7. Calculation of energy indicators in the formation of energy passports of industrial enterprises and buildings.
8. Calculation of energy indicators in energy monitoring at industrial enterprises.
9. Formation of energy service at industrial enterprises
10. Calculation of electricity waste.
11. Calculation of energy savings through the use of non-traditional energy sources in the energy supply of consumers.
12. Definitions and prices in energy. Calculation of the amount of payment for the forms of energy consumed.
13. Settlement with consumers for electricity according to a differentiated definition
14. Calculation of electricity waste in lines and transformers
15. Calculation of electricity waste at industrial enterprises
16. Calculation of energy savings at household consumers
17. Energy-economic indicators for the regulation of fuel and energy resources
18. Calculation of quantities characterizing electrical load graphs.
19. Calculation of the calculated load using the main and auxiliary methods.
20. Calculation and selection of the amount of compensated reactive power.
21. Project management. Project scope and objectives. Network analysis. Engineering support tools, operations and task planning.
22. Impact of environmental factors. Impact of external factors on the

activities of engineering organizations, issues of ethics and corporate social responsibility.

IV. Independent learning 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.

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5. Calculation of electricity waste in lines and transformers
6. Calculation of electricity waste at industrial enterprises
7. Calculation of energy savings at household consumers
8. Energy-economic indicators for the regulation of fuel and energy resources
9. Calculation of quantities characterizing electrical load graphs.
10. Calculation of the calculated load using basic and auxiliary methods.
11. Calculation and selection of the amount of compensated reactive power.
21. Project management. Project scope and objectives. Network analysis. Engineering support tools are planning operations and tasks.
22. The influence of environmental factors. The influence of external factors on the activities of engineering organizations, issues of ethical and corporate social responsibility.

Practical classes are held in an auditorium equipped with multimedia devices by one professor per academic group. Classes are conducted using active and interactive methods and, accordingly, it is desirable to arouse students' interest in the possibilities of deepening knowledge through the use of appropriate pedagogical and information technologies, to provide the opportunity to independently obtain results, and to prepare them theoretically and methodologically.

2.4. Instructions and recommendations for laboratory work

The following topics are recommended for laboratory work: 1. Study of the working process of devices for measuring the flux density of solar radiation;

2. Study of the structure and operation of the luxmeter RS 180-7133;
3. Study of the working process of a thermal imager;
4. The principle of operation of the motion sensor and analysis of the types of motion sensors;
5. Schemes of motion sensors and their principle of operation, connection schemes;
6. Study of the operation of a small paraboloid-type solar concentrator;
7. Determination of the temperature at the focus of a small paraboloid-

type solar concentrator with a diameter of 80 cm;

8. Study of the temperature regimes of the solar photovoltaic module;
9. Types of energy-saving and sound-insulating materials;
10. Study of the operation of active solar water heaters;
11. Fundamentals of investment project management and management of project changes in energy efficiency.
12. Information and marketing management of energy management and economic assessment of energy efficiency.
13. Assessment of the economic efficiency of investments in energy saving measures.
14. Calculation of energy consumption when conducting an energy audit.
15. Study of graphs of electrical loads of industrial enterprises.

In the process of laboratory work, students develop skills in studying automated energy accounting and control systems in the power supply system, studying the principle of operation of single- and three-phase meters, testing energy testing devices, and studying methods for automatic adjustment of reactive power.

Laboratory work should be conducted by one teacher in a laboratory auditorium equipped with devices representing the topic, with the number of students per academic group being up to 15.

2.5. Instructions and recommendations for course work (project)
Course work (project) is not included in the curriculum.

2.6. Independent study and independent work
Recommended topics for independent study:

1. The role of energy in Uzbekistan;
2. The history of the development of electric power in Uzbekistan;
3. The role and current state of energy management in Uzbekistan; 4.

Requirements for international energy management standards;

5. Energy resources and their types;
6. Definitions and prices set for electricity in foreign countries;
7. Experience of foreign countries in energy conservation;
8. Waste in the power supply system;
9. Norm and its types;
10. Forecasting and its types;
11. Experience of foreign countries in regulating electricity;
12. Stages of conducting an energy audit at industrial enterprises;
13. Formation of an energy balance at industrial enterprises;
14. Energy audit and its types;
15. Energy passport of energy installations;
16. Energy passport of industrial enterprises;
17. Energy monitoring and its types;
18. Conducting energy monitoring at industrial enterprises;
19. Formation of energy services at industrial enterprises;
20. Energy indicators at industrial enterprises and their calculation;
21. State of energy services of foreign countries;
22. Investment and its types;
23. Formation of investment projects;
24. Energy efficiency
25. The concept of energy efficiency;
26. Information management of energy management;
27. Marketing management of energy management;
28. Methods of energy efficiency management;
29. Evaluation of energy efficiency projects;
30. Performance indicators of energy efficiency projects.

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	18 points	

					the number of tasks)	
				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. Kazuo Matsuda, YasukiKansha, ChihiroFushimo, Atsushi Tsutsumi, Akira Kishimoto. Advanced Energy Saving and its Applications in Industry. Japan – “Springer”, 2013. – 94 p. 2. Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari. O‘quv qo‘llanma. – T.: “Voriz”, 2014 – 192 bet. 3. Аллаев К.Р., Хошимов Ф.А. Энергосбережение в промышленных предприятиях, Монография. – Т.:Fan. 2012. 4. Блинов ЙУ.И., Василев А.С., Никаноров А.Н. и др. Современные энергосберегающие электротехнологии. Учебное пособие. Издательство СПбГЕТУ «ЛЕТИ», 2001. – 564 с. Additional literature: 5. Mirziyoev SH.M. Erkin va farovon, demokratik O‘zbekiston davlatini birgalikda barpo etamiz. O‘zbekiston Respublikasi Prezidentining lavozimiga 6. O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha Harakatlar strategiyasi to‘g‘risida. - T.:2017 yil 7 fevral, PF-4947-sonliFarmoni. 7. O‘zbekiston Respublikasining “Energiyadan ratsional foydalanish to‘g‘risida” gi Qonuni. 1997-yil 25-aprel. 8. O‘zbekiston Respublikasining “Elektr energetika to‘g‘risida”gi Qonuni. 30-sentyabr 2009-yil. 9. Taslimov A.D., Rismuxamedov D.A., Raxmonov I.U. Elektr ta’minoti tizimida energiya nazorati va hisobi fanidan laboratoriya ishlari uchun uslubiy qo‘llanma. – T.: ToshDTU, 2014. 10. Saidxodjaev A.G., Saidxodjaeva M.A. Energiya tejamkorlik asoslari fanidan amaliy va mustaqil ishlar uchun uslubiy qo‘llanma. – T.: ToshDTU, 2015. 11. Энергетический менеджмент. Учебное пособие.Владимир 2014. 12. ТерешкинаТ.Р.Системыэнергоменеджмента.Стандарт ISO-50001. Учебное пособие.Санкт-Петербург–2013. Information sources: www.gov.uz – Government portal of the Republic of Uzbekistan. www.catback.ru – International scientific articles and educational materials website. www.google.ru – International educational materials search website.

	www.ziynet.uz – National educational materials search website. www.lex.uz – National database of UzRes.Konun documents. www.catback.ru – Scientific articles and educational materials.

Subject name	Reliability and safety of the power supply system (ECTS 6)
Subject/module code	ELXI1706
Science taught semester (s).	4 th semester
Responsible teacher	Jalilov Urunboy Abdunaim ugli, assistant.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 180 Audience Training hours - 72 Lecture training hour - 36 Laboratory training hour - 24 Practical training hour - 12 Independent education - 108 hours
ECTS	6
The purpose and tasks of subject / learning outcomes	The goal of teaching the subject is to develop theoretical and practical knowledge in students about the reliability of electronic devices in the energy sector.. The task of the subject is to study the current state of the energy system, to familiarize with the specific features of the main enterprises and organizations that are part of the country's energy system, to teach various methods of generating electricity. In addition, to provide theoretical knowledge and develop practical skills in the transmission, distribution and use of electricity. Learning outcomes: 1. Studies the issues of reliability in the energy and power supply system, the development, history and prospects of the power system 2. The role and socio-economic significance of reliability in the energy and power supply system. 3. State policy in the energy sector and its development trends and prospects in the country and the world 4. Basic concepts in the power sector. 5. Key performance indicators for various types of transport and opportunities for their improvement 6. Increasing the efficiency of electricity generation equipment 7. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation 8. Knowledge of the main existing legal and regulatory documents in the field and their use
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Definitions of reliability theory in power supply systems and its basic concepts Topic 2: Concept, classification, flows and their characteristics of failures in power supply systems. Topic 3: Reliability indicators in power supply systems. Topic 4: Causes of failures of the main elements of the power supply system. Topic 5: Mathematical statistics and reliability calculations in power engineering Topic 6: Methods for calculating the reliability of complex circuits in power supply systems. Topic 7: Analysis of the consequences of failure of power equipment in power supply systems. Topic 8: Feasibility analysis of reliability in power supply systems. Topic 9: Average probability of failure of elements of the power

supply system by reliability indicators

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, 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:

1. Application of the Binomial Distribution (Bernoulli) formula in reliability analysis and solving related problems;
2. Methods for calculating the reliability of a power supply system and solving related problems.
3. Probability theory in energy and solving related problems.
4. Probability laws of complex events and solving related problems
5. Reliability of circuits with elements connected in series and solving related problems
6. Reliability of circuits with elements connected in parallel and solving related problems

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with the study of 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 training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of a practical training is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

Recommended practical topics:

1. Reliability of the power supply system.
2. Reliability issues in the energy and power supply system.
3. Reliability characteristics of the power supply system
4. Failure currents of the elements of the power supply system and their characteristics.
5. Complex reliability indicators in the power supply system.
6. Causes of failure of the main elements of the power supply system.

IV. Independent learning 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.

Independent study of the recommended topics:

1. Basic concepts and characteristics of reliability in the power supply system
2. Reliability characteristics of the power supply system
3. The concept of failure in the power supply system.
4. Failure currents of the elements of the power supply system and their characteristics.
5. Unified indicators of reliability in the power supply system.
6. Calculation of the conditions of power networks.
7. Simple and complex substances and their significance.
8. Power and energy losses in power networks.

	9. Random quantities of reliability and their distribution laws. 10. Basic concepts of mathematical statistics and reliability calculations in power engineering. 11. Modeling the operating conditions of power networks using computer programs, developing practical skills.
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. Steven W. Blume, Electronic power systembasics, USA, 2007.31-bet 2. Karimov R.Ch., Rafiqova G.R., E.G.Usmonov, M.R.Ro'zinazarov. Yo'nalishga kirish. Ma'ruzalar matni,-T.: ToshDTU nashriyoti,2018.26-bet 3. Qodirov T.M., Alimov X.A., "Sanoat korxonalarining elektr taminoti", O'quv qo'llanma, -T.: ToshDTU bosmaxonasi, 2006.22-bet 4. Allayev Q.R., "Электроэнергетика Узбекистана и мира", -T.: "Fan va texnologiya", 2009.42-bet 5. Majidov T.Sh. Noanaviy va qayta tiklanuvchi energiya manbalari, o'quv qo'llanma,-T.: 2014. 21-bet 6. Taslimov A.D., Rasulov A.N., Usmonov E.G., Elektr taminoti, O'quv qo'llanma,-T.: "ILM ZIYO" nashriyoti, 2012.14-bet 7. S. Orifjonov "Elektromagnetizm" T. "Noshir" 2011.40-bet 8. A.A. Abdumalikov "Elektrodinamika" T. 2011. 20-bet Additional literature: 9. Mirziyoyev Sh.M. Yangi O'zbekistonda erkin va farovon yashaylik. –T.: "TASVIR nashriyot uyi", – 2021.– 50 b. 10. Mirziyoyev Sh.M. Milliy taraqqiyot yo'limizni qati'yat bilan davom ettirib yangi bosqichga ko'taramiz .–T.: "O'zbekiston", 2017–592 11. O'zbekiston Respublikasi Prezidentining 2022-yil 28-yanvardagi PF-60-son "2022-2026 yillarga mo'ljallangan Yangi O'zbekistonning taraqqiyot strategiyasi to'g'risida"gi Farmoni. 12. O'zbekiston Respublikasi Prezidentining "Energiya tejovchi texnologiyalarni joriy qilish va kichik quvvatli qayta tiklanuvchi energiya manbalarini rivojlantirish bo'yicha qo'shimcha chora-tadbirlar to'g'risida"gi 09.09.2022 yildagi PF-220-son farmoni.				

	13. Лыпкин А.В. Электрические системы и сети (Электронный ресурс): (учеб. пособ.)– Новосибирск: Изд-во НГТУ, 2002.-248 с 14. Электрические системы и сети. Буслова Н.В., Винославский В.Н., Данисенко Т.И., Перхач В.С. Под ред. Данисенко Г. – Киев: Высшая школа, 2006. 15. Блок В.М. Электрические сети и системы. Высшая школа, 2006. Internet sources: 16. www.ziyonet.uz – milliy o‘quv materiallarini qidiruv sayti. 17. www.gov.uz – O‘zbekiston Respublikasining hukumat portali. 17. www.google.com – xalqaro o‘quv materiallarini qidiruv sayti. 19. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali 20. www.twirpx.com – xalqaro o‘quv materiallarini qidiruv sayti.

Name of subject	Installation and operation of the power supply system (ECTS 6)
Subject/module code	ETTM1706
Science taught semester (s).	7 th semester
Responsible teacher	Narimonov Bahodir Absalomovich, senior teacher
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours - 180 . Audience Training hours - 72. Lecture hours - 36 Laboratory hours - 12 Practical hours - 24 Independent learning - 108 hours
ECTS	6
The purpose and tasks of subject / learning outcomes	The purpose and task of teaching the subject is to form theoretical and practical knowledge in students not only in the energy sector, but also in all areas that interact with it. The main task of the subject is to study the current state of the energy system, to familiarize students with the specific features of the installation and operation of the power supply system of the main enterprises and organizations included in the country's energy system and residential areas, and to provide theoretical knowledge and develop practical skills in the electrical installation of overhead lines and various types of electrical equipment.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Technical safety when performing electrical installation work. General principles of electrical installation work. Topic 2: Structure and structural elements of overhead power lines Topic 3: Installation of electrical equipment and overhead lines of the power supply system. Topic 4: Recommendations for lightning protection of overhead power lines. Topic 5: Selection, preparation of wires and insulators, assembly and installation of supports. Topic 6: Selection and connection of power cables. Promising connection methods, installation of cable connectors (couplings) Topic 7: Installation of switching devices with voltages up to 1000 volts. Topic 8: Installation of switchgear with voltages above 1000 volts. Topic 9: Operation, installation and operation of electric machines (asynchronous and synchronous). Topic 10: Installation and commissioning of power transformers. Topic 11: Installation of instrument transformers Topic 12: Installation and assembly of oil and vacuum circuit breakers Topic 13: Methods of grounding electrical equipment (grounding) Topic 14: Selection of insulators depending on voltage in the power supply system Topic 15: Functions of ZNOM and ZROM equipment and methods of connecting them to the network. Topic 16: Methods of using capacitors in the power supply system and their installation Topic 17: Transposition method and installation in electrical overhead lines. II. Guidelines and recommendations for organizing laboratory exercises. In laboratory classes, students develop practical skills and

competencies in various indicators of processes in electrical networks and systems, conducting experiments, calculating and drawing tables and graphs..

Suggested topics for laboratory work :

1. Technical safety rules. Inspection of dielectric gloves and protective equipment
2. Measurement of insulation resistance of electrical devices
3. Checking and selecting the rated current of the fuse-link installation.
4. Disconnecting and starting electric motors from the network and reversing them in laboratory conditions
5. 6-10 Study of gas-dynamic processes in arc extinguishing in 6-10 kV circuit breakers.
6. Research of protective shutdown devices UZO automatic and differential automatic devices

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training session begins with the study of 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

Recommended practice topics:

1. Calculation of overhead line parameters based on the types, power, and operating conditions of electrical consumers. .
2. Analysis of the cooling system of power transformers. 2. Analysis of the cooling system of power transformers..
3. Calculation of technical inspection and testing of cable line elements before installation
4. Conditions for calculating the selection of storage devices
5. Calculation of parameters and insulation resistance of measuring transformers
6. Study the structural design of 6-10 kV circuit breakers and calculate their technical parameters.
7. Calculation methods for grounding electrical equipment (grounding)
8. Calculation methods for the selection and installation of switching devices.

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.

Independent study for recommended topics1.

1. Installation of power supply system equipment and overhead lines
2. Structure and structural elements of overhead power lines
3. Recommendations for lightning protection of overhead power lines
4. Wire rope installation, connection of air lines wires, preparation for use
5. Assembly of reactors and contactors
6. Installation of switchgear with voltage up to 1000 volts
7. Installation, operation and maintenance of electric motors (asynchronous and synchronous).

	8. Installation and commissioning of power transformers 9. Calculation of parameters and insulation resistance of measuring transformers. 10. Installation and assembly of oil and vacuum circuit breakers
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. Kazuo Matsuda, Yasuki Kansha, Chihiro Fushimo, Atsushi Tsutsumi, Akira Kishimoto. Advanced Energy Saving and its Applications in Industry. Japan – “Springer”, 2013. – 94 p. 2. Xoshimov F.A. Taslimov A.D. Energiya tejamkorligi asoslari. O., quv qo., llanma. – T. “Voriz”, 2014 – 192 bet. 3. Аллаев К. Р. Хошимов Ф. А. Энергосбережение в промышленных предприятиях, Монография. – Т.: Фан. 2012. 4. Блинов Ю. И., Василев А. С. Никаноров др. Современные энергосберегающие электротехнологии. Учебное пособие. Издательство «ЛЕТИ», 2001. – 564 с.с. 5. Сибкин Д. М., Справочник по эксплуатации электроустановок промышленных предприятий: 5-е изд., испр. и доп. - М.: Высшая школа 2002 6. Справочник по наладке электрооборудования промышленных предприятий, Под ред. М. Г. Зименкова, Г. В. Розенберга, Е. М. Фескова. – 3-е изд., перераб. и доп. – М.: Энергоатомиздат, 2003. 7. Правила устройства электроустановок (ПУЭ) / Государственная инспекция “Узэнергонадзор”. Под общ. ред. Л. Д. Ниматуллаев, Б. Т. Ташпулатова, А. Н. Усманова / MChJ «Fan-Poligraf, 2011. 8. Elektr tarmoqlari va tizimlari: O‘quv qo‘llanma/ A.M. Safarov, T.Sh. G‘oyibov, A.X. Sulliyev. O‘zbekiston Respublakasi Oliy va o‘rta maxsus ta’lim vazirligi. Toshkent. Tafakkur bo‘stoni. 2013.-224 b. 9. Gayibov T.Sh. Elektr tarmoqlari va tizimlari. O‘quv qo‘llanma. – T.: «Voriz-nashriyot». 2010. 10. T.Sh. Gayibov., B.M. Pulatov., A.E. Shanazarov. “Elektr tarmoqlari va tizimlari. Misol va masalalar to‘plami”. O‘quv qo‘llanma.				

–Toshkent., ToshDTU, 2021-175 b.

11.T.Sh. Gayibov, H.F. Shamsutdinov, B.M. Pulatov Elektr tarmoqlari va tizimlari fanidan kurs loyihasini bajarish uchun uslubiy qo‘llanma. – Toshkent: ToshDTU, 2015-57 b.

12.Electric Power Systems/ B.M.Weedy, B.J.Cory, N.Jenkins, J.B.Ekanayake, G.Strbac.- 5th ed., UK, A John Wiley and Sons, 2012.

13. Duncan Glover, Mulucutla s. Sarma, Thomas J. Overbye. Power System Analysis and Design/Fifth edition.- Australia, Brazil, Japan, United Kingdom, USA. CANGAGE Learning. 2010.

14. Arthur R. Bergen/ Power Systems Analysis / 2000.

15. Elektr tarmoqlari va sistemalari: uslubiy qo‘llanma/ O‘zR OO‘MTV; Rasulov A.N., Taslimov A.D., Mamarasulova F.S., Raxmonov I.U.– Toshkent: TDTU, 2014.- 90 b.

Main literature: Additional literature:

1. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b.

2. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati‘yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b

11. O‘zbekiston Respublikasi Prezidentining 2022-yil 28-yanvardagi PF-60-son “2022-2026 yillarga mo‘ljallangan Yangi O‘zbekistonning taraqqiyot strategiyasi to‘g‘risida”gi Farmoni.

12. O‘zbekiston Respublikasi Prezidentining “Energiya tejoychi texnologiyalarni joriy qilish va kichik quvvatli qayta tiklanuvchi energiya manbalarini rivojlantirish bo‘yicha qo‘shimcha chora-tadbirlar to‘g‘risida”gi 09.09.2022 yildagi PF-220-son farmoni.

13. Лыпкин А.В. Электрические системы и сети (Электронный ресурс): (учеб. пособ.)– Новосибирск: Изд-во НГТУ, 2002.-248 с

14. Электрические системы и сети. Буслова Н.В., Винославский В.Н., Данисенко Т.И., Перхач В.С. Под ред. Данисенко Г. – Киев: Высшая школа, 2006.

15. Блок В.М. Электрические сети и системы. Высшая школа, 2006.

Internet manbalar:

16. www.ziyonet.uz – milliy o‘quv materiallarini qidiruv sayti.

17. www.gov.uz – O‘zbekiston Respublikasining hukumat portali.

17. www.google.com – xalqaro o‘quv materiallarini qidiruv sayti.

19. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali

20.https://www.politesi.polimi.it/bitstream/10589/203854/3/Tesi_Roberta_Castellammare.pdf

21. www.twirpx.com – xalqaro o‘quv materiallarini qidiruv sayti.

Name of subject	Engineering psychology (ECTS 4)
Subject/module code	MUHP2604
Science taught semester (s).	6 th semester
Responsible teacher	Rajabov Orifjon Kxonimqulovich, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-120. Audience Training hours - 48. Lecture training hour – 24 Workshop training hour – 24 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject it consists in understanding the importance of psychological factors in engineering activities in students, studying the relationship of the human factor and the technical system, forming decision-making skills based on psychological criteria that ensure the effectiveness and reliability of human activity in technical systems. It is also aimed to prepare students to analyze psychological states such as stress, fatigue, attention, motivation, communication and leadership that occur in engineering activities, to take into account psychophysiological and cognitive factors in the design of human-machine systems. The task of the subject to explain to students the connection between engineering activities and human psychology; to study the role of the human factor in engineering activities, its actions, its impact on decision-making processes; to analyze the effectiveness, reliability and probability of error in human performance in technical systems; to identify psychological problems in production and teach ways to eliminate them; to teach the basics of ergonomics, security, motivation, ; The formation of skills to use psychological criteria in the design of technical systems in accordance with human capabilities; consists in teaching effective communication and psychological adaptation mechanisms in engineering processes. Learning outcomes: 1. Understanding the content and significance of psychological factors in engineering activities. 2. Identification and assessment of human activity and characteristics of human-machine systems in technical systems. 3. Having knowledge of psychological security, stress and fatigue reduction in working conditions. 4. To identify problems related to collective activity, communication, leadership and psychological adaptation in production and make recommendations for their solution. 5. To have psychological approaches to analyzing, preventing and increasing the level of security of human error.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Subject, purpose and objectives of the science of engineering psychology. Definition, object and subject of engineering psychology. History of the emergence and development of engineering psychology Topic 2: Engineering psychology research methods. Psychological methods. The use of physiological methods in engineering psychology. Topic 3: An understanding of Professionography. Social description of the engineering profession. Psychological description of the activities

of engineering personnel. Professional abilities and professional skills in the engineer system. The concept of professional disorder and ways to prevent them.

Topic 4: Engineering psychology as a field of Labor psychology. Concepts of engineering psychology and Technical Aesthetics. Human cooperation with production techniques. Engineering psychology faning problems.

Topic 5: Cognitive processes and professional development of the individual. Cognitive processes. Awareness of attention, its types. The concept of the sensory process. Sensory characteristics and types. The concept of memory. Types of memory and their characteristics. Understanding of perception. Distinctive features of perception in Professional Psychology.

Topic 6: Professional activity, motivation and motivation, motives of labor activity. Psychology of labor activity. Personality motivations in the interpretation of American Scientists. The level of awareness of motives: social ustanovka and the problem of its transformation. Classification of motives.

Topic 7: the role of intelligence and creativity in the training of Future Engineers. The concept of intelligence and creativity. The interaction of intelligence and creativity. Intellect-capacity-mind-talent-talent. History of modern tests in the measurement of intelligence. The role of the environment and heredity in the formation of intelligence. Sexual differences in the development of intelligence.

Topic 8: Professional Ethics and individual characteristics of an engineer. Professional ethics and etiquette issues in engineering activities. Classification of Individual-typological features. Diagnosis of personality talents and abilities. Psychological structure of abilities. Temperament and individual characteristics of activity. Character and personality.

Topic 9: the role of emotional-volitional and personal qualities in improving the effectiveness of engineering activities. Understanding of emotion. Manifestation of emotion. Manifestation of emotion. Moods, stress, depression, euphoria. Motivation for volitional behavior. Making decisions according to the emotional-volitional sphere.

Topic 10: the role of thinking in engineering activities. Thinking and its features. Types and forms of thinking. Thinking operations and laws. Qualities of thinking. Individual characteristics and development of thinking.

Topic 11: the formation and development of the communication culture of Future Engineers. Understanding of communication. Communicative sphere of communication. The perceptual side of communication. Types of communication

Topic 12: Conflicts in professional activities and ways to prevent them. The concept of conflict, its essence and structure. Conflict prevention roads.

II. Workshop training instructions and recommendations

The teacher's preparation for a workshop training session begins with the study of preliminary 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 workshop training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting workshop training sessions.

The purpose of the workshop training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for workshop training:

	1. Subject, purpose and objectives of the science of engineering psychology. 2. Engineering psychology research methods. 3. The concept of professionography. 4. Engineering psychology as a field of Labor psychology. 5. Cognitive processes and professional development of personality. 6. Motives of professional activity, motivation and motivation, labor activity. 7. The role of intelligence and creativity in the training of future engineers. 8. Professional ethics and individual characteristics of the engineer. 9. The role of emotional-volitional and personal qualities in improving the effectiveness of the work of an engineer. 10. The role of thinking in engineering activities. 11. Formation and development of the communication culture of Future Engineers. 12. Conflicts in professional activities and ways to prevent them. III. Independent learning 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 history of the development of the science of engineering psychology and its role and significance in the system of Sciences. 2. Classification of research methods of engineering psychology, the field of application of methods. 3. Personality psychology and professional formation. 4. Motives of labor activity. Motives for choosing an engineering profession. 5. Personality awareness activities. 6. Attention and issues of choice of profession. Perception, memory, thinking and professional activity 7. Emotional-volitional sphere of personality and adaptation to the profession 8. Ability, speech and profession 9. Temperament and occupation 10. Individual style of activity and temperament 11. Character and professional qualities 12. Professional maturation of the individual. An individual's perception of professional identity 13. Motives of a person in professional maturation 14. Understanding and scientific perceptions of conflicts in professional self-awareness 15. Identification of professional interests and abilities.
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. Б.Ф.Ломов., Инженерная психология. М.:“Висшая школа” 2001. 2. Хрестоматия по инженерной психологии. Под редакцией Б.А. Душкова. М.: Высшая школа. 1991. 3. Ivanov R.I., Zufarova M.E. Umumiy psixologiya. Darslik.T.: O'zb-n faylasuflar milliy jamiyati 2008 4. Safayev N.S., Mirashirova N.A. “Umumiy psixologiya nazariyasi va amaliyoti“ TDPU, 2013 y, B.100-113. 5. Sh.X.Abdullayeva. Kasbiy psixologiya. –T.: « Innovatsion rivojlantirish nashriyot-matbaa uyi » 2020. 196 bet. 6. Qodirov B.R. Kasbiy tashxis metodikalar to`plami. O`quv qo`llanma. – T.: Noshir, 2003.</li> <li>7. G`oziyev E.G`. Kasb psixologiyasi. O`quv qo`llanma. – T.: Noshir, 2003.</li> <li>8. Корнетов Г. Педагогика. (учебное пособие) 2003.</li> <li>9. Z.N.Yulchieva. Kasbiy psixologiY. O`quv qo`llanma. T.: «Fan va texnologiya» nashriyoti, 2019. 10. Baron R.A. 2001/Indian reprint 2002 Psychology (5 ched) Allyn & Bakon. Additional literature: 11. Mirziyoev SH.M. Erkin va farovon demokratik O‘zbekiston davlatini birgalikda barpo etamiz.Toshkent,O‘zbekiston, 2016.-56b. 12. Mirziyoev SH.M. Tanqidiy taxlil, qat’iy tartib - intizom va shaxsiy javobgarlik – xar bir raxbar faoliyatining kundalik qoidasi bo‘lishi kerak. Toshkent, O‘zbekiston, 2017.-104 b 13. Mirziyoev SH.M. O‘zbekistonni rivojlantirishning beshta ustuvor yo‘nalishi bo‘yicha Xarakterlar strategiyasi. T., O‘zbekiston, 2017. “Gazeta. uz”. 14. Karimova V.M. va boshqalar. PsixologiY., Darslik – 2008. Internet resources: 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.twirpx.com – international educational materials search site. 19. www.psychology.net.ru – international psychology teaching materials search site.					

Subject Title:	The New Edition of the Constitution of the Republic of Uzbekistan (ECTS 4)
Subject/module code	YTO·RK2604
Science taught semester (s).	6 th semester
Responsible teacher	Fayzullayev Klara Abdullaevna, assistant.
Language of Instruction	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-120 Audience Training hours - 60 Lecture training hour – 30 Laboratory training hour – 0 Practical training hour – 30 Independent education -60 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	Course Objective: The main objective of teaching this course is to develop students' theoretical knowledge and practical skills in applying the legal norms of the New Edition of the Constitution of the Republic of Uzbekistan. It aims to continuously enhance students' legal awareness and legal culture, ensure thorough mastery of the New Edition of the Constitution, and actively promote its implementation in society. Furthermore, the course seeks to explain the scientific and practical meaning of the articles of the New Edition of the Constitution in a clear and accessible language. It also includes coordinating scientific and methodological measures for the preparation of new curricula, textbooks, and other educational materials based on the New Edition of the Constitution. Course Tasks: The primary task of the course is to instill in students an understanding of the role and significance of the New Edition of the Constitution in the life of society. It aims to internalize the essence and meaning of the Constitution in the legal consciousness, thinking, and culture of the people—especially the younger generation—and, through this, to foster a deep respect for the renewed Constitution and the law in society. Learning Outcomes: Upon successful completion of this course, students will be able to: 1. Explain the interrelationship between the Constitution, constitutional law, and other branches of law. 2. Understand the specific characteristics of the Constitution of the Republic of Uzbekistan. 3. Clearly articulate the essence of the principle of separation of powers enshrined in the Constitution of the Republic of Uzbekistan. 4. Identify and distinguish the similarities and differences in the constitutional rights and freedoms of individuals as reflected in the Constitution. 5. Acquire the skills to provide legal advice concerning the constitutional rights of individuals and citizens. 6. Present oral and written arguments and counterarguments regarding complex issues related to constitutional law. 7. Identify legal norms and legislative documents relevant to constitutional legal issues. 8. Provide oral and written arguments and counterarguments regarding the conformity of legal norms with the Constitution of the Republic of Uzbekistan.

Course Content (Topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: The Constitution contains norms regarding state sovereignty, popular power, the supremacy of the constitution and the law. Topic 2: Human rights and freedoms. Topic 3: The Constitution contains important guarantees regarding human rights during inquiry, investigation, and trial. Topic 4: Important provisions in the Constitution regarding the rights of a suspect, accused or defendant. Topic 5: The right to education. Topic 6: Important provisions on health care in the Constitution. Topic 7: The Constitution sets out important social obligations of the state. Topic 8: Important news in the social and political spheres in the Constitution. Topic 9: Guarantees for environmental and ecological rights in the Constitution. Topic 10: Guarantees given to entrepreneurs in the Constitution. Topic 11: Norms related to the duties of citizens in the Constitution. Topic 12: News about justice in the Constitution. Topic 13: Important democratic changes in the Constitution regarding the system of state power and administration. Topic 14: The Constitution contains provisions related to the activities of civil society institutions. Topic 15: The Constitution contains provisions on foreign policy and defense and security. II. Practical training instructions and recommendations The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform. Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions. The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view. The following topics are recommended for practical training: • Provisions in the Constitution regarding state sovereignty, people's power, and the supremacy of the Constitution and the law • Human rights and freedoms • Important guarantees of human rights during inquiry, investigation, and judicial proceedings in the Constitution • Key provisions in the Constitution regarding the rights of suspects, accused, or defendants • The right to education • Important provisions in the Constitution on healthcare • Key social obligations of the state outlined in the Constitution • Important innovations in the social and political spheres in the Constitution • Guarantees related to environmental and ecological rights in the Constitution • Guarantees provided to entrepreneurs in the Constitution • Provisions related to citizens' duties in the Constitution • Innovations related to fair justice in the Constitution • Important democratic reforms regarding the system of state power and governance in the Constitution

	• Provisions related to the activities of civil society institutions in the Constitution • Provisions on foreign policy, defense, and security in the Constitution Independent Study and Self-Directed Work Independent learning competencies are aimed at helping students develop self-directed learning skills and improving the effectiveness of their professional activities. Students complete independent assignments either in traditional form or electronically, under the guidance of the instructor, using their mobile devices or other learning tools. Recommended Topics for Independent Study: 1. The concept, essence, and characteristics of a constitution; the functions and types of constitutions. 2. The First Constitution of the Independent Republic of Uzbekistan and its distinctive features. 3. The adoption of the New Edition of the Constitution and its practical necessity. 4. The concept of citizens' constitutional rights and freedoms in the Republic of Uzbekistan. 5. Personal rights and freedoms of citizens and their consolidation in the Constitution. 6. Political rights and democratic freedoms of citizens. 7. Constitutional foundations of economic, social, cultural, and environmental rights. 8. Guarantees of citizens' rights and freedoms in the Constitution and the duties of citizens. 9. The constitutional and legal status of the President of the Republic of Uzbekistan. 10. The role and functions of the Oliy Majlis in the system of state bodies under the renewed Constitution. 11. The Cabinet of Ministers of the Republic of Uzbekistan and changes in its core functions. 12. Constitutional foundations of the judicial system in the Republic of Uzbekistan; the role of advocacy and prosecution bodies in the renewed Constitution. 13. The administrative-territorial structure of the Republic of Uzbekistan. 14. Civil society institutions, public associations, and the system and functions of other non-governmental non-profit organizations. 15. Guarantees and protection of the rights, freedoms, and legal interests of children in the Constitution. 16. The protection of youth's personal, political, economic, social, cultural, and environmental rights by the state 17. Constitutional foundations of electoral rights. 18. State sovereignty in the New Edition of the Constitution of the Republic of Uzbekistan. 19. The principle of separation of powers in the system of state governance in the New Edition of the Constitution. 20. The powers of the President of the Republic of Uzbekistan as reflected in the New Edition of the Constitution. It is recommended that students prepare and present essays (term papers) based on the topics listed above for independent study.
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	10 points	

				seminars, practical, laboratory classes)		
	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. Constitution of the Republic of Uzbekistan. – Tashkent: “Uzbekistan” Publishing House, 2023. 2. O‘zbekiston Respublikasi Prezidentining 2023 yil 8 maydagi “Yangi tahrirdagi O‘zbekiston Respublikasi Konstitutsiyasini amalga oshirish bo‘yicha birinchi navbatdagi chora-tadbirlar to‘g‘risida” gi PF-67-sonli Farmoni// https://lex.uz/docs/-6461609. 3. Yangi tahrirdagi O‘zbekiston Respublikasi Konstitutsiyasi.O‘quv qo‘llanma. Mualliflar jamoasi. - Toshkent: “Yuridik adabiyotlar publish”.2024 yil. 4. Yangilanayotgan Konstitutsiya. 100 savolga 100 javob.O‘zbekiston Respublikasi Prezidenti huzuridagi Qonunchilik va huquqiy siyosat instituti. – Toshkent.“Adolat” milliy huquqiy axborot markazi.2023 yil. 5. Saidov A.X. O‘zbekiston Konstitutsiyasi tarixi.Toshkent.“Tasvir”.2018 yil. 6. Saidov A.X.Konstitutsiyaviy huquq.Darslik.- Toshkent: “Somplex Print”.2019 yil. 7. O‘zbekiston Respublikasining Konstitutsiyasiga sharh.Mualliflar jamoasi. - Toshkent: “TDYUI”.2012 yil. 8. Jahon Konstitutsiyalari (Jahon davlatlari Konstitutsiyalari to‘plami, 1-jild). Tuzuvchilar: U.Tojixonov, A.X.Saidov.T.O‘zbekiston Respublik: IIV Akademiyasi.2001 yil. 9. Xorijiy mamlakatlar konstitutsiyaviy huquqi.Mualliflar jamoasi.Darslik. “TDYUI”.2010 yil. 10. A.Saidov.O‘zbekiston Respublikasi Konstitutsiyasi: Mustaqillik va demokratik taraqqiyot huquqiy asosi.Toshkent: “O‘zbekiston”.2012 yil. 11. Husanov O.T.O‘zbekiston Respublikasining Konstitutsiyaviy huquqi. Darslik. Toshkent: “TDYUI”.2012 yil. 12. Husanov O.T.Konstitutsiyaviy huquq.Darslik. - Toshkent: “Adolat” nashriyoti.2013 yil. 13. Husanov O.T.Konstitutsiyaviy huquq.Darslik.To‘ldirilgan va qayta ishlangan ikkinchi nashr. – Toshkent: “Yuridik adabiyotlar publish”.2020 yil. 14. Husanov O.T.Konstitutsiyaviy huquq.Darslik.To‘ldirilgan va qayta ishlangan to‘rtinchi nashr. -Toshkent: “Yuridik adabiyotlar publish”.2022 yil. 15. O.T.Xusanov, N.K.Jamalov, N.M.Akayeva, N.F.Saydalixodjayeva Konstitutsiyaviy huquq.O‘quv qo‘llanma.Toshkent: 2020 yil. 16. B.T.Musayev, K.R.Aliyeva, B.A.Narimanov.Konstitutsiyaviy huquq. Darslik. - Toshkent: “TDYU”.2020 yil.					

17. Konstitutsiyaviy huquq.Darslik.Mualliflar jamoasi. - Toshkent: "JXU".2023 yil.

18. O'zbekiston Respublikasining Konstitutsiyaviy huquqi.Darslik.Mualliflar jamoasi. - Toshkent: "TDYUI".2005 yil.

19. Konstitutsiyaviy huquq. Darslik. X.T.Odilqoriyev, O'.X.Muxamedov, B.X.Saidov va boshq.: Mas'ul muharrir. Sh.T.Ikramov. - T.: "O'zbekiston Respublikasi IIV Akademiyasi".2014 yil.

20. Mo'minov A., Tillaboyev U.Inson huquqlari.Darslik. - T.: "TDYUI".2013 yil.

21. O'zbekiston Respublikasining Konstitutsiyaviy huquqi.Mualliflar jamoasi. Darslik. – T.: "Moliya".2002 yil.

Additional Literature:

1. O'zbekiston Respublikasi Konstitutsiyasiga sharh. Mas'ul muharrir: A.A. Azizxo'jayev A.A. - Toshkent: "O'zbekiston".2008 yil.

2. Saidov A.X.O'zbekiston Respublikasi Konstitutsiyasi: mustaqil va demokratik taraqqiyotning huquqiy asosi. - Toshkent: "O'zbekiston".2012 yil.

3. Fuqarolar saylov huquqlarining kafolatlari.O'zbekiston Respublikasi Markaziy saylov komissiyasi raisi Z.Nizamxodjayev, professor R.Hakimovlarning umumiy tahriri ostida.O'zbekiston Respublikasi Markaziy saylov komissiyasi.Toshkent davlat yuridik universiteti."Adolat" milliy huquqiy axborot markazi.2021 yil.

4. Konstitutsiyasiviy huquq entsiklopedik lug'at.O'zbekiston Respublikasi Adliya vazirligi.Mualliflar jamoasi. - Toshkent: "O'zbekiston".2006 yil.

5. Asadov Sh., Xayitov X.Mahalliy davlat hokimiyati organlari.O'quv qo'llanma. – T.: "TDYUI".2013 yil.

6. Kanyazov YE., Zulfiqorov Sh., Turg'unov O.O'zbekiston Respublikasi saylov tizmi va saylov qonunchiligi. – T.: "TDYUU".2014 yil.

Information Sources:

1. <https://lex.uz>
2. <http://www.senat.uz>
3. <http://www.juristlib.uz>
4. <http://www.pravo.vsem.uz>
5. <http://www.parliament.uz>
6. <https://library-tsul.uz>
7. [https://\(https://president.uz\)http://www.gov.uz](https://(https://president.uz)http://www.gov.uz)
8. <http://www.edu.uz>
9. <http://www.ziyonet.uz>
10. <https://ziyouz.uz>
11. <https://www.google.uz>

Name of subject	Energy audit of electrical systems (ECTS 8)
Subject/module code	ETEA26708
Science taught semester (s).	6 th and 7 th semesters
Responsible teacher	Nazarov Furkat Daminovich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240. Audience Training hours – 96 Lecture training hour – 48 Laboratory training hour – 24 Practical training hour – 24 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The goal of teaching the subject is to teach students the fundamentals of rational use of energy, standardization of consumption by energy form, energy conservation management, use of secondary energy resources, and the implementation of energy conservation policies in practice. The task of the discipline is to evaluate methods for controlling current energy consumption at a facility, study energy management processes and practices, energy management information systems, energy audit methods, develop measures to increase energy efficiency, and study their feasibility. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the role and socio-economic significance of electric power in society. 3. Study the state policy of the energy sector and its development trends and prospects in the country and the world. 4. To have an idea of systematic analysis in solving organizational and technical issues in managing the energy sector of industrial enterprises. 5. Study of key performance indicators for various types of energy devices and opportunities for their improvement. 6. Economic assessment of service quality and its competitiveness by type of energy devices. 7. Knowledge of and ability to use the main legal and regulatory documents available in the field.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of instrumental energy audit at industrial enterprises Topic 2: Types and methods of measurements in instrumental energy audit Topic 3: Insulators and line fittings. Cable structure and cable lines. Topic 4: Standardization of electrical energy consumption at industrial enterprises Topic 5: Current state of energy consumption. Statistical reports. Topic 6: Direct measurement of energy and energy carrier consumption Topic 7: Partial and indirect measurement of energy and energy carrier consumption parameters Topic 8: World experience in the application of new energy-saving technologies in industry Topic 9: Assessment of electricity consumption by lighting systems

and electrical appliances

Topic 10: Assessment of electricity consumption by air conditioners and office equipment

Topic 11: Calculation of heat energy consumption by consumers

Topic 12: Energy balance and its types

Topic 13: Methods and equipment for conducting energy audits

Topic 14: Definitions for heat and electricity

Topic 15: Calculation of electricity consumption by consumers

Topic 16: Accounting for natural gas by consumers

Topic 17: Heat and gas supply systems of industrial enterprises

Topic 18: Energy saving due to reactive power compensation

Topic 19: Cross-sectional audit of energy consumption

Topic 20: Analysis of the efficiency of energy consumption at the facility

Topic 21: Definition of enterprises and buildings

Topic 22: Feasibility study of energy-saving measures

Topic 23: Development of energy-saving recommendations

Topic 24: Analysis of energy use by the end consumer.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies in various indicators of processes in Energy audit of electrical 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. Energy saving reserves and energy saving measures in various sectors of industry
2. World experience in the application of new energy-saving technologies in industry
3. Power supply system of industrial enterprises
4. Determination and adjustment of the efficiency of heat exchange devices used in industry
5. Heat and gas supply systems of industrial enterprises
6. Compilation of exergy balances of heat-consuming devices
7. Thermal schemes and efficiency of modern steam and gas plants.
8. Settlement with consumers for electricity at a flat rate
9. Correct selection of electric motors by power
10. Saving electricity using reactive power compensation
11. Examples of compiling an energy audit report
12. Calculation of the technical and economic efficiency of energy-saving measures.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Application of new energy-saving technologies in industrial heat supply systems
2. Assessment of energy consumption by electric heating and cooling

	devices 3. Assessment of energy consumption by steam heating devices 4. Steam-gas device with steam spraying 5. Energy efficiency in industry 6. Heat supply in compressor equipment utilization devices 7. Energy saving in the gas industry 8. Energy saving in boiler houses 9. Operating modes of boiler plants 10. Energy saving in heat supply systems 11. Reducing heat loss through the use of double-chamber windows 12. Infrared heating system for industrial facilities. IV. Independent learning 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. Comparison of energy consumption data 2. Cross-sectional energy consumption audit 3. Analysis of energy consumption efficiency at the facility 4. Description of the enterprise and buildings 5. Feasibility study of energy saving measures 6. Development of energy saving recommendations 7. Analysis of energy use by the end consumer 8. Energy distribution and energy conversion 9. Development and evaluation of energy consumption improvement projects 10. Energy saving in heat supply systems 11. Saving electricity using reactive power compensation 12. Feasibility study of energy saving measures 13. Development of energy saving recommendations 14. Analysis of energy use by the end consumer 15. Energy distribution and energy conversion 16. Development and evaluation of energy consumption improvement projects 17. Energy saving in heat supply systems 18. Reducing heat loss through the use of double-chamber windows 19. Energy saving in electrical networks.
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. Steven W.Blume. Electric Power System Basics. USA.: Wiley – Interscience A John Wiley&Sous, INC Publication, 2007, 260 p 2. Липкин Б.Ю., "Электроснабжение промышленных предприятий и установок", Учебник. -М.: "Высшая школа", 1980. 3. Кудрин Б.И., Электроснабжения промышленных предприятий. Учебник. -М.: Интермет Инжиниринг, 2005. 4. Qodirov T.M., Alimov H.A., «Sanoat korxonalari elektr ta'minoti», O'quv qo'llanma, ToshDTU. -T.: 2006. 5. Qodirov T.M., Alimov H.A., «Sanoat korxonalari va fuqoro binolarining elektr ta'minoti», O'quv qo'llanma, ToshDTU. -T.: 2007. 6. Taslimov A.D., Rasulov A.N., Usmonov E.G., elektr ta'minoti», O'quv qo'llanma Электр таъминоти. Ilm-ziyo. -T.: 2012. Additional literature: 7. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'grisida-T.2017yil 7 fevral,PF-4947-sonli Farmoni. 8. Uzbekistan Respublikasi «Energiyadan oqilona foydalanish togrisida» qonuni. 2019 y. 9. Конюхова Е.А., Электроснабжение объектов: Учебное пособие. -М.: Издательство «Мастерство»; Высшая школа, 2001. 10. Ополева Г.Н., Схемы и подстанции электроснабжения: Справочник: Учебное пособие. - М.: ФОРУМ: ИНФРА-М, 2006. 11. Гулямов Б.Х., Салиев А.Г., Ташпулатов Б.Т., Тешабаев Б.М., Правила устройства электроустановок. Узгосэнергонадзор. -Т.: 2007. 12. Аллаев К.Р., Энергетика мира и Узбекистана. Аналитический обзор. -Т.: Издательство «Молия», 2007. 13. Аллаев К.Р., Электроэнергетика Узбекистана и мира. -Т.: «Фан ва технология», 2009. Internet resources: 16. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. 17. www.ziynet.uz – national educational materials search site. 18. www.gov.uz – Government portal of the Republic of Uzbekistan. 19. www.google.com – international educational materials search site. 20. www.energystrategy.ru – “Energy Policy and Strategy” information portal 21. www.twirpx.com – international educational materials search site.

Name of subject	Energy audit of electrotechnological processes of industrial enterprises (ECTS 8)
Subject/module code	SKEJEA26708
Science taught semester (s).	6 th and 7 th semesters
Responsible teacher	Nazarov Furkat Daminovich, PhD., senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240. Audience Training hours – 96 Lecture training hour – 48 Laboratory training hour – 24 Practical training hour – 24 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The goal of teaching the subject is to teach students the fundamentals of rational use of energy, standardization of consumption by energy form, energy conservation management, use of secondary energy resources, and the implementation of energy conservation policies in practice. The task of the discipline is to evaluate methods for controlling current energy consumption at a facility, study energy management processes and practices, energy management information systems, energy audit methods, develop measures to increase energy efficiency, and study their feasibility. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the role and socio-economic significance of electric power in society. 3. Study the state policy of the energy sector and its development trends and prospects in the country and the world. 4. To have an idea of systematic analysis in solving organizational and technical issues in managing the energy sector of industrial enterprises. 5. Study of key performance indicators for various types of energy devices and opportunities for their improvement. 6. Economic assessment of service quality and its competitiveness by type of energy devices. 7. Knowledge of and ability to use the main legal and regulatory documents available in the field.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of instrumental energy audit at industrial enterprises Topic 2: Types and methods of measurements in instrumental energy audit Topic 3: Insulators and line fittings. Cable structure and cable lines. Topic 4: Standardization of electrical energy consumption at industrial enterprises Topic 5: Current state of energy consumption. Statistical reports. Topic 6: Direct measurement of energy and energy carrier consumption Topic 7: Partial and indirect measurement of energy and energy carrier consumption parameters Topic 8: World experience in the application of new energy-saving technologies in industry Topic 9: Assessment of electricity consumption by lighting systems

and electrical appliances

Topic 10: Assessment of electricity consumption by air conditioners and office equipment

Topic 11: Calculation of heat energy consumption by consumers

Topic 12: Energy balance and its types

Topic 13: Methods and equipment for conducting energy audits

Topic 14: Definitions for heat and electricity

Topic 15: Calculation of electricity consumption by consumers

Topic 16: Accounting for natural gas by consumers

Topic 17: Heat and gas supply systems of industrial enterprises

Topic 18: Energy saving due to reactive power compensation

Topic 19: Cross-sectional audit of energy consumption

Topic 20: Analysis of the efficiency of energy consumption at the facility

Topic 21: Definition of enterprises and buildings

Topic 22: Feasibility study of energy-saving measures

Topic 23: Development of energy-saving recommendations

Topic 24: Analysis of energy use by the end consumer.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies in various indicators of processes in Energy audit of electrotechnological processes of industrial enterprises, conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Energy saving reserves and energy saving measures in various sectors of industry
2. World experience in the application of new energy-saving technologies in industry
3. Power supply system of industrial enterprises
4. Determination and adjustment of the efficiency of heat exchange devices used in industry
5. Heat and gas supply systems of industrial enterprises
6. Compilation of exergy balances of heat-consuming devices
7. Thermal schemes and efficiency of modern steam and gas plants.
8. Settlement with consumers for electricity at a flat rate
9. Correct selection of electric motors by power
10. Saving electricity using reactive power compensation
11. Examples of compiling an energy audit report
12. Calculation of the technical and economic efficiency of energy-saving measures.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Application of new energy-saving technologies in industrial heat supply systems
2. Assessment of energy consumption by electric heating and cooling

	devices 3. Assessment of energy consumption by steam heating devices 4. Steam-gas device with steam spraying 5. Energy efficiency in industry 6. Heat supply in compressor equipment utilization devices 7. Energy saving in the gas industry 8. Energy saving in boiler houses 9. Operating modes of boiler plants 10. Energy saving in heat supply systems 11. Reducing heat loss through the use of double-chamber windows 12. Infrared heating system for industrial facilities. IV. Independent learning 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. Comparison of energy consumption data 2. Cross-sectional energy consumption audit 3. Analysis of energy consumption efficiency at the facility 4. Description of the enterprise and buildings 5. Feasibility study of energy saving measures 6. Development of energy saving recommendations 7. Analysis of energy use by the end consumer 8. Energy distribution and energy conversion 9. Development and evaluation of energy consumption improvement projects 10. Energy saving in heat supply systems 11. Saving electricity using reactive power compensation 12. Feasibility study of energy saving measures 13. Development of energy saving recommendations 14. Analysis of energy use by the end consumer 15. Energy distribution and energy conversion 16. Development and evaluation of energy consumption improvement projects 17. Energy saving in heat supply systems 18. Reducing heat loss through the use of double-chamber windows 19. Energy saving in electrical networks.
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. Steven W.Blume. Electric Power System Basics. USA.: Wiley – Interscience A John Wiley&Sous, INC Publication, 2007, 260 p 2. Липкин Б.Ю., "Электроснабжение промышленных предприятий и установок", Учебник. -М.: "Высшая школа", 1980. 3. Кудрин Б.И., Электроснабжения промышленных предприятий. Учебник. -М.: Интермет Инжиниринг, 2005. 4. Qodirov T.M., Alimov H.A., «Sanoat korxonalari elektr ta'minoti», O'quv qo'llanma, ToshDTU. -T.: 2006. 5. Qodirov T.M., Alimov H.A., «Sanoat korxonalari va fuqoro binolarining elektr ta'minoti», O'quv qo'llanma, ToshDTU. -T.: 2007. 6. Taslimov A.D., Rasulov A.N., Usmonov E.G., elektr ta'minoti», O'quv qo'llanma Электр таъминоти. Ilm-ziyo. -T.: 2012. Additional literature: 7. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'grisida-T.2017yil 7 fevral,PF-4947-sonli Farmoni. 8. Uzbekistan Respublikasi «Energiyadan oqilona foydalanish togrisida» qonuni. 2019 y. 9. Конюхова Е.А., Электроснабжение объектов: Учебное пособие. -М.: Издательство «Мастерство»; Высшая школа, 2001. 10. Ополева Г.Н., Схемы и подстанции электроснабжения: Справочник: Учебное пособие. - М.: ФОРУМ: ИНФРА-М, 2006. 11. Гулямов Б.Х., Салиев А.Г., Ташпулатов Б.Т., Тешабаев Б.М., Правила устройства электроустановок. Узгосэнергонадзор. -T.: 2007. 12. Аллаев К.Р., Энергетика мира и Узбекистана. Аналитический обзор. -T.: Издательство «Молия», 2007. 13. Аллаев К.Р., Электроэнергетика Узбекистана и мира. -T.: «Фан ва технология», 2009. Internet resources: 16. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. 17. www.ziynet.uz – national educational materials search site. 18. www.gov.uz – Government portal of the Republic of Uzbekistan. 19. www.google.com – international educational materials search site. 20. www.energystrategy.ru – “Energy Policy and Strategy” information portal 21. www.twirpx.com – international educational materials search site.

Name of subject	Electrical part of stations and substations (ECTS 9)
Subject/module code	SPEQ23409
Science taught semester (s).	3 rd and 4 th semesters
Responsible teacher	Anarboyev Muhiddin Almanovich. PhD., associate professor
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-270. Audience Training hours - 108. Lecture training hour – 60 Laboratory training hour – 24 Practical training hour – 24 Independent education -162 hours
ECTS	9
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop skills and competencies in students in the classification and structural structure of the energy sector, processes of electricity generation, and the effective operation of electrical devices under specific operating conditions.. The task of the subject is to the role of the electric power industry in the rapid development of the economy is incomparable. Due to the stable operation of the energy system of Uzbekistan, the national economy is provided with uninterrupted and high-quality electric energy. This process, in turn, increases the demand for training highly qualified personnel. This program reflects the goals, objectives, and content of the subject “Electrical part of the station and substation”. In-depth study of the subject of the electrical part of the station and substation plays an important role in solving the problems of the harmful effects of energy on the environment. Learning outcomes: 1. The course on the electrical part of the station and substation studies the equipment of the electrical part of the station and substation in the electric power system. 2. High-voltage devices used in the electrical part of the station and substation. 3. Devices with voltages below 1000 V used in the electrical part of the station and substation. 4. Basic concepts in the field of electric power. 5. Basic performance indicators for various types of equipment and opportunities for their improvement. 6. Increasing the efficiency of electricity generation equipment. 7. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. Goals and objectives of the discipline “Electrical part of the station and substation”. History of the development of electric power in Uzbekistan. Nominal voltage of the elements of the electrical system and operating modes of neutrals. Topic 2: Synchronous generators. Nominal parameters of generators. Structure of turbogenerators and hydrogenerators. Cooling system of generators. Air cooling systems. Hydrogen and water cooling systems of generators. Topic 3: Excitation systems of synchronous generators. Self-excitation and independent excitation systems of generators. Topic 4: Automatic adjustment of generator excitation. Field

quenching of synchronous generators. Synchronous compensators

Topic 5: Types of power transformers and their parameters.

Cooling systems of power transformers. Natural cooling with air and oil

Topic 6: Integration of power plants consisting of renewable energy sources into power networks.

Topic 7: Structure and operating modes of autotransformers. Voltage adjustment of transformers. transformer voltage adjustment under load. Voltage adjustment in autotransformers.

Topic 8: Low-voltage devices, switchgear and reclosers.

Topic 9: Distribution systems at power plants and substations.

Topic 10: High-voltage circuit breakers. Low-oil circuit breakers. Air circuit breakers. Electromagnetic, vacuum circuit breakers. Gas-insulated and synchronous circuit breakers.

Topic 11: Network problems, electrical systems and their design, load stabilization.

Topic 12: Voltage transformers.

Topic 13: Selection of basic electrical equipment and current-carrying parts. Switchgear, automatic machine, contactor, fuse. Selection of current transformers and voltage transformers.

Topic 14: Selection of current transformers and voltage transformers.

Topic 15: Electrical connection diagram of stations and substations. Basic requirements for the main diagrams of electrical installations.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies in various indicators of processes in electrical part of stations and substations, conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Connecting synchronous generators to the power system.
2. Studying the operating modes of generators.
3. Studying the connection groups, schemes and main parameters of transformer windings.
4. Parallel operation of transformers
5. Studying the load capacity of transformers
6. Checking the insulation control scheme in an alternating current network
7. Checking current transformers.
8. Checking voltage transformers.
9. Checking the oil-immersed switch and its drive mechanisms.
10. Remote control of switches
11. Studying fuse-links
12. Determining the mutual electrodynamic voltages of the buses..

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

	The following topics are recommended for practical training: 1. Selection of conductors for continuous current. 2. General information about digital substations 3. Single and double-strip tires. 4. Selection of low-voltage electrical equipment. 5. Selection of base insulators. 6. Selection of the number and power of insulators in the substation. 7. Selection of high-voltage electrical equipment. Selection of circuit breakers. 8. Selection of disconnectors. 9. Selection of short-circuit and dividers. 10. Selection of current transformers. 11. Selection of voltage transformers. 12. System diagrams of power plants and substations. Single-system busbar scheme. 13. Electric arc and methods of extinguishing it. Two-system busbar scheme. Single-circuit busbar and single-system busbar scheme. 14. Study of closed distribution devices and open distribution devices. The working bus system is a scheme of two working and circulating busbars, non-sectionalized and sectionalized. 15. Own demand systems of stations and substations IV. Independent learning 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. Operating modes of neutrals of electrical devices; 2. Electrical load graphs; 3. Automatic extinguishing of the generator field; 4. Neutral operating modes of power transformers in the power system and insulation testing; 5. Methods for calculating short circuits in power systems; 6. Thermal and dynamic effects of short circuit currents; 7. Electric arc and methods for extinguishing it; 8. Grounding devices; 9. Electrical connection schemes of stations and substations; 10. Own demand systems of power plants and substations;
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	50 points (10 points per	30 points

		(5 questions)	question)	
	* 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. Allaev K-P., Siddikov I.X., Xdkimov MD-, Ibragimov R.I., Siddikov O.I., SHamsutdinov X-F- «Stansiya va podstansiyalarning elektr jixozlari».-O‘quv qo‘llanma, T.: Cho‘lpon nomidagi NMIU, 2014. 2. Рожкова Л.Д. Карнеева Л.К. Чиркова Т.В.«Электрооборудование электрических станций и подстанций». Учебное пособие. 4-издания -М.:Издательский центр «Академия», 2007. 3. Белецкий О.В., Лезнов С.И. «Обслуживание электрических подстанций». Учебное пособие. М.: энергоатомиздат, 1985. 4. Быстрицкий Г.Ф. Кудрин Б.И. «Выбор и эксплуатация силовых трансформаторов». Учебное пособие для вузов. М.: Издательский центр «Академия», 2003. 5. Неклепаев Б.Н. «Электрическая часть станций и подстанций». Учебное пособие. - М.: энергоатомиздат, 1986. 6. Рожкова А.Д., Козулин Б.С. «Stansiya va podstansiyalarning elektr asbob-uskunalarini». Darslik- T.: O‘qituvchi,1986. 7. Салов В.П. Справочник по ремонту, наладке и техническому обслуживанию электрооборудования. Учебное пособие. Издательство «Вента-2», 2007. 8.Majidov T.Sh. Noanaviy va qayta tiklanuvchi energiya manbalari, o‘quv qo‘llanma,-T.: 2014. 9.Taslimov A.D., Rasulov A.N., Usmonov E.G., Elektr taminoti, O‘quv qo‘llanma,-T.: “ILM ZIYO” nashriyoti, 2012. 10.S. Orifjonov “Elektromagnetizm” T. “Noshir” 2011. 11. A.A. Abdumalikov “Elektrodinamika” T. 2011. 12.K.Аллаев,”Энергетика мира и Узбекистана”2009г. Additional literature: 13. SH.Mirziyoev “Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz” – T.: O‘zbekiston 2017. 14. O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha Xarakatlar strategiyasi to‘g‘risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 15. Чунихин А.А. электрических аппарат. –Учебное пособие , М: энергоатомиздат, 1988. 16. Неклепанов Б.Н. , И.П. Крючков. электрическая часть станций и потстанций. –М: энергоатомиздат, 1989. 17. Abduraxmanov K.P., ТигайО.Э., XamidovV.S. Комплекс мультимедийных лекций, o‘zbek va rus tillarida. Internet resources: 18. www.gov.uz – O‘zbekiston Respublikasining hukumat portali. 19. www.catback.ru – xalqaro ilmiy maqola va materiallar sayti. 20. www.google.ru – xalqaro o‘quv materiallarini qidiruv sayti. 21. www.ziyonet.uz – milliy o‘quv materiallarini qidiruv sayti			

Name of subject	Measurements of production technological processes (ECTS 9)
Subject/module code	SPEQ23409
Science taught semester (s).	3 rd and 4 th semesters
Responsible teacher	Anarboyev Muhiddin Almanovich, PhD., associate professor
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-270. Audience Training hours - 108. Lecture training hour – 60 Laboratory training hour – 24 Practical training hour – 24 Independent education -162 hours
ECTS	9
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop skills and competencies in students in the classification and structural structure of the energy sector, processes of electricity generation, and the effective operation of electrical devices under specific operating conditions.. The task of the subject is to the role of the electric power industry in the rapid development of the economy is incomparable. Due to the stable operation of the energy system of Uzbekistan, the national economy is provided with uninterrupted and high-quality electric energy. This process, in turn, increases the demand for training highly qualified personnel. This program reflects the goals, objectives, and content of the subject “Electrical part of the station and substation”. In-depth study of the subject of the electrical part of the station and substation plays an important role in solving the problems of the harmful effects of energy on the environment. Learning outcomes: 1. The course on the electrical part of the station and substation studies the equipment of the electrical part of the station and substation in the electric power system. 2. High-voltage devices used in the electrical part of the station and substation. 3. Devices with voltages below 1000 V used in the electrical part of the station and substation. 4. Basic concepts in the field of electric power. 5. Basic performance indicators for various types of equipment and opportunities for their improvement. 6. Increasing the efficiency of electricity generation equipment. 7. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. Goals and objectives of the discipline “Electrical part of the station and substation”. History of the development of electric power in Uzbekistan. Nominal voltage of the elements of the electrical system and operating modes of neutrals. Topic 2: Synchronous generators. Nominal parameters of generators. Structure of turbogenerators and hydrogenerators. Cooling system of generators. Air cooling systems. Hydrogen and water cooling systems of generators. Topic 3: Excitation systems of synchronous generators. Self-excitation and independent excitation systems of generators. Topic 4: Automatic adjustment of generator excitation. Field

quenching of synchronous generators. Synchronous compensators

Topic 5: Types of power transformers and their parameters.

Cooling systems of power transformers. Natural cooling with air and oil

Topic 6: Integration of power plants consisting of renewable energy sources into power networks.

Topic 7: Structure and operating modes of autotransformers. Voltage adjustment of transformers. transformer voltage adjustment under load. Voltage adjustment in autotransformers.

Topic 8: Low-voltage devices, switchgear and reclosers.

Topic 9: Distribution systems at power plants and substations.

Topic 10: High-voltage circuit breakers. Low-oil circuit breakers. Air circuit breakers. Electromagnetic, vacuum circuit breakers. Gas-insulated and synchronous circuit breakers.

Topic 11: Network problems, electrical systems and their design, load stabilization.

Topic 12: Voltage transformers.

Topic 13: Selection of basic electrical equipment and current-carrying parts. Switchgear, automatic machine, contactor, fuse. Selection of current transformers and voltage transformers.

Topic 14: Selection of current transformers and voltage transformers.

Topic 15: Electrical connection diagram of stations and substations. Basic requirements for the main diagrams of electrical installations.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies in various indicators of processes in Measurements of production technological processes, conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions.

Recommended topics for laboratory work:

1. Connecting synchronous generators to the power system.
2. Studying the operating modes of generators.
3. Studying the connection groups, schemes and main parameters of transformer windings.
4. Parallel operation of transformers
5. Studying the load capacity of transformers
6. Checking the insulation control scheme in an alternating current network
7. Checking current transformers.
8. Checking voltage transformers.
9. Checking the oil-immersed switch and its drive mechanisms.
10. Remote control of switches
11. Studying fuse-links
12. Determining the mutual electrodynamic voltages of the buses..

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

	The following topics are recommended for practical training: 1. Selection of conductors for continuous current. 2. General information about digital substations 3. Single and double-strip tires. 4. Selection of low-voltage electrical equipment. 5. Selection of base insulators. 6. Selection of the number and power of insulators in the substation. 7. Selection of high-voltage electrical equipment. Selection of circuit breakers. 8. Selection of disconnectors. 9. Selection of short-circuit and dividers. 10. Selection of current transformers. 11. Selection of voltage transformers. 12. System diagrams of power plants and substations. Single-system busbar scheme. 13. Electric arc and methods of extinguishing it. Two-system busbar scheme. Single-circuit busbar and single-system busbar scheme. 14. Study of closed distribution devices and open distribution devices. The working bus system is a scheme of two working and circulating busbars, non-sectionalized and sectionalized. 15. Own demand systems of stations and substations IV. Independent learning 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. Operating modes of neutrals of electrical devices; 2. Electrical load graphs; 3. Automatic extinguishing of the generator field; 4. Neutral operating modes of power transformers in the power system and insulation testing; 5. Methods for calculating short circuits in power systems; 6. Thermal and dynamic effects of short circuit currents; 7. Electric arc and methods for extinguishing it; 8. Grounding devices; 9. Electrical connection schemes of stations and substations; 10. Own demand systems of power plants and substations;
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. Allaev K-P., Siddikov I.X., Xdkimov MD-, Ibragimov R.I., Siddikov O.I., SHamsutdinov X-F- «Stansiya va podstansiyalarning elektr jixozlari».-O‘quv qo‘llanma, T.: Cho‘lpon nomidagi NMIU, 2014. 2. Рожкова Л.Д. Карнеева Л.К. Чиркова Т.В.«Электрооборудование электрических станций и подстанций». Учебное пособие. 4-издания -М.:Издательский центр «Академия», 2007. 3. Белецкий О.В., Лезнов С.И. «Обслуживание электрических подстанций». Учебное пособие. М.: энергоатомиздат, 1985. 4. Быстрицкий Г.Ф. Кудрин Б.И. «Выбор и эксплуатация силовых трансформаторов». Учебное пособие для вузов. М.: Издательский центр «Академия», 2003. 5. Неклепаев Б.Н. «Электрическая часть станций и подстанций». Учебное пособие. - М.: энергоатомиздат, 1986. 6. Рожкова А.Д., Козулин Б.С. «Stansiya va podstansiyalarning elektr asbob-uskunalarini». Darslik- T.: O‘qituvchi,1986. 7. Салов В.П. Справочник по ремонту, наладке и техническому обслуживанию электрооборудования. Учебное пособие. Издательство «Вента-2», 2007. 8.Majidov T.Sh. Noanaviy va qayta tiklanuvchi energiya manbalari, o‘quv qo‘llanma,-T.: 2014. 9.Taslimov A.D., Rasulov A.N., Usmonov E.G., Elektr taminoti, O‘quv qo‘llanma,-T.: “ILM ZIYO” nashriyoti, 2012. 10.S. Orifjonov “Elektromagnetizm” T. “Noshir” 2011. 11. A.A. Abdumalikov “Elektrodinamika” T. 2011. 12.K.Аллаев,”Энергетика мира и Узбекистана”2009г. Additional literature: 13. SH.Mirziyoev “Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz” – T.: O‘zbekiston 2017. 14. O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha Xarakatlar strategiyasi to‘g‘risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 15. Чунихин А.А. электрических аппарат. –Учебное пособие , М: энергоатомиздат, 1988. 16. Неклепанов Б.Н. , И.П. Крючков. электрическая часть станций и потстанций. –М: энергоатомиздат, 1989. 17. Abduraxmanov K.P., Tigay O.E., Xamidov V.S. Комплекс мультимедийных лекций, o‘zbek va rus tillarida. Internet resources: 18. www.gov.uz – O‘zbekiston Respublikasining hukumat portali. 19. www.catback.ru – xalqaro ilmiy maqola va materiallar sayti. 20. www.google.ru – xalqaro o‘quv materiallarini qidiruv sayti. 21. www.ziynet.uz – milliy o‘quv materiallarini qidiruv sayti

Name of subject	Electric machines (ECTS 4)
Subject/module code	ELMASH2304
Science taught semester (s).	3 rd semester
Responsible teacher	Saodullayev Abror Saypullayevich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-120. Audience Training hours - 48. Lecture training hour – 24 Laboratory training hour – 0 Practical training hour – 24 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching this subject: The aim of the course is to teach students the structure and principles of operation of electric machines, their selection, operation, analysis of the physical processes occurring in them, calculation of the energy efficiency of electric machines, and formation and development of the design thinking of electric machines, teaching them to clearly state their opinions and conclusions in a well-founded manner, and to develop the skills to apply them in practice. The task of the subject is to teach students how to construct switching circuits for electric machines and determine their parameters, calculate and analyze the characteristics of electric machines, evaluate various operating modes of electric machines, control electric machines and adjust their speeds; design electric machines, and teach them the basic criteria for increasing and ensuring the efficiency of electric machines. Learning outcomes: 1.The student studies the nature of electromechanical phenomena in nature and technology of electric machines through the fundamental concepts of the science of electric machines. 2.The student studies the structure, operating principle, applications and characteristics of transformers. 3.The student studies the structure, operating principle, applications and characteristics of alternating current machines. 4.The student studies the structure, operating principle, applications and characteristics of direct current machines.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Physical processes occurring in transformers. Magnetic cores of transformers and the structure of magnetic cores. Electromagnetic processes occurring in no-load and short-circuit modes of the transformer. Topic 2: EYUK and currents in transformer windings. Conversion of electrical parameters of the secondary winding of a transformer to the number of windings of the primary winding. Transformer T-shaped switching schemes and vector diagrams. Topic 3: Transformatorning tashqi tavsifi. Kuchlanishni rostlash. Transformator chulg‘amlari ulanish guruhlari. Parallel ulash shartlari. Topic 4: Parts and diagrams of the stator winding of alternating current machines. Magnetic motive forces (MMF) and magnetic fields. Pulsating, elliptical and circular rotating magnetic fields. Topic 5: Types of asynchronous machines, their structure and operating principle. Operating modes of an asynchronous machine. Topic 6: Vector diagrams of an induction machine. Energy diagram

of an induction machine. Electromagnetic (rotating) torque and mechanical characteristics of an induction machine.

Topic 7: Description of the operation of an induction motor. Starting an induction motor. Adjusting the rotation frequency of an induction motor. Induction generator, electromagnetic processes in it and their characteristics.

Topic 8: Modern series and special types of induction machines. Induction frequency converter.

Topic 9: Types of synchronous generators, structure and operating principle of synchronous machines. Types of excitation of synchronous generators. Armature reaction.

Topic 10: Parallel connection of a synchronous machine to an electrical network. Synchronization methods. Structure and principle of operation of a synchronous motor. Operating characteristics of a synchronous motor.

Topic 11: DC machine. The structure of DC machines and the principle of operation as generators. Characteristics of DC generators.

Topic 12: The structure of DC motors and physical processes in motors. Starting DC motors. Methods of adjusting the speed of DC motors.

II. Instructions and recommendations for practical training

The department will develop instructions and recommendations for organizing practical training. In it, students will further enrich the knowledge and skills they have acquired on the main lecture topics through practical problems and cases. It is also recommended to consolidate students' knowledge based on textbooks and manuals, use handouts, increase students' knowledge by publishing scientific articles and theses, solve problems, prepare presentations and visual aids on topics, use regulatory legal documents, etc.

Recommended practice topics:

1.Determination of the main parameters of a single-phase toroidal transformer;

2.Determination of the connection group of single- and three-phase transformer windings. Determination of the parameters of single-phase toroidal and Scott transformers for short-circuiting and short-circuiting;

3.Determination of the voltage drop of a transformer operating with a load. Determination of the parameters of autotransformers;

4.Check the conditions for parallel connection of transformers;

5.Starting an asynchronous motor using an additional resistance;

6.Determination of the parameters of a repulsion electric motor;

7.Solving problems related to methods for adjusting the rotation frequency of an asynchronous motor. Determination of the parameters of capacitor electric motors;

8.Calculation of the capacitances of the working and starting capacitors for connecting a three-phase asynchronous motor to a single-phase network;

9.Construction of the adjustment characteristic of a synchronous generator. Construction of the external characteristic of a synchronous generator;

10.Construction of the U-shaped characteristic of a synchronous generator. Construction of the angular characteristic of a synchronous generator;

11.External characteristics of DC generators;

12.Calculation of parameters of multifunctional DC motors
Calculation of mechanical characteristics of an DC motor;

	III. Independent learning 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. Independent study for the recommended topics: 1.Transformers by operating modes. 2.Types of special transformers. 3.General issues of alternating current machines. 4.Special asynchronous machines. 5.Special synchronous machines. 6.Special DC machines. 7.Calculation of the main parameters of the transformer based on experimental data. 8.Construction of a characteristic of the transformer in the case of sudden and short-circuit operation; 9.Construction of an external and adjusting characteristic of the transformer; 10.Calculation of the useful efficiency of the transformer depending on its power; 11.Checking the conditions for parallel connection of transformers; 12.Starting an asynchronous motor using additional resistance; 13.Determination of the operating characteristics of an asynchronous motor using a circular diagram of currents; 14.Accurate calculation of the mechanical characteristics of an asynchronous motor; 15.Calculation of the working and starting capacitor capacities for connecting a three-phase asynchronous motor to a single-phase network; 16.Construction of the Potye diagram of a synchronous generator; 17.Construction of the adjustment characteristic of a synchronous generator; 18.Calculation of power losses in DC machines; 19.Switching in DC machines; 20.Determination of the main parameters of an DC motor;
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.Salimov J.S., Pirmatov N.B. Elektr mashinalari.– T.: O‘zbekiston faylasuflari milliy jamiyati nashriyoti, 2011. –408 b. 2.Mustafakulova G.N., Toirov O.Z., Bekishev A.E. Elektr mashinalari. Toshkent.: Tafakkur avlodi. 2020. 191 b. 3.Majidov S. Elektr mashinalari va elektr yuritma. - T.: O‘qituvchi, 2002. -358 b. 4.S. K. Sahdev/Electrical Machines/ © Cambridge University Press 2018 5.Testing of Power Transformers under participation of ° Carlson Ake Jitka Fuhr Gottfried Schemel Franz Wegscheider 1st Edition published by Pro Print GmbH, Düsseldorf ISBN 3-00-010400-3-2003. 6.Alimxodjayev K.T., Pirmatov N.B., Ziyoxodjayev T.I. Elektr mashinalari.- T.: “Fan va texnologiya”, 2018. -344 b. 7.Alimxodjayev K.T., Pirmatov N.B., Ziyoxodjayev T.I., Mustafakulova G.N. Elektr mashinalari va transformatorlarning ekspluatatsiyasi. - T.: “Fan va texnologiya”, 2019. -240 b. 8.Копылова И.П. Электрические машины: Учебник для бакалавр – Москва:. Юрайт, 2012. – 675 с. 9.Иванов – Смоленский А.В. Электрические машины. В 2-х т. Учебник для вузов.– М.: Изд-воМЭИ, 2004. Том. 1 – 652 с, Том 2 – 532 с. 10.Salimov J.S., Pirmatov N.B., Bekchanov B.E. Transformatorlar va avtotransformatorlar. T.: “VEKTOR-PRESS”, 2010.-224 b. 11.N.B.Pirmatov, A.S.Saodullayev, A.Y.Bekishev, N.A.Qurbonov «Elektr mashinalari» o‘quv qo‘llanma O‘zbekiston Respublikasi Oliy va o‘rta-maxsus ta’lim vazirligi. – Toshkent: «ZEBO PRINT» nashriyoti. 2022.-197 b. 12.A.Saodullayev, U.Mirzayev «Elektr mashinalari fanidan tajriba mashg‘ulotlarini bajarishga oid uslubiy ko‘rsatma» Jizzax-2022. JizPI nashriyoti, 60 b. Additional literature: 13.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. 14.Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini ta’minlash – yurt taraqqiyoti va xalq farovonligining garovi. O‘zbekiston Respublikasi Konstitusiyasi qabul qilinganining 24 yilligiga bag‘ishlangan tantanali marosimdagi ma’ruza 2016 yil 7 dekabr. – T.: “O‘zbekiston” NMIU, 2016. – 48 b. 15.Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – T.: “O‘zbekiston” NMIU, 2017. – 488 b. 16.O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha Harakatlar strategiyasi to‘g‘risida. – T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 17.Pirmatov N.B., Yarmuxamyedova Z.A., Mustafakulova G.N. Elyektr mashinalari fanining transformatorlar qismi bo‘yicha kurs loyihasini bajarishga oid o‘quv-myetodik qo‘llanma. –T.: ToshDTU, 2012 – 117 b. 18.Кацман М.М. Сборник задач по электрическим машинам. Учеб. Пособие для вузов. –Москва.: – Издательский центр «Академия». 2012. –154 с. 19.Mustafakulova G.N., Toshev Sh.E. Elektr mashinalari fanidan laboratoriya mashg‘ulotlarini bajarish uchun metodik ko‘rsatma. –T.:

	TDU, 2015. – 45 b. 20.Pirmatov N.B., Zayniyeva O.E. Elektromexanika (Elektr mashinalari) fanidan masalalar to‘plami. O‘quv qo‘llanma. –T.: TDU, 2004. – 75 b. Internet resources: 21.www.ziyouet.uz 22.http://dhes.ime.mrsu.ru/studies/tot/tot_lit.htm; 23.http://rbip.bookchamber.ru/description.aspx?product_no=854; 24.http://energy-mgn.nm.ru/progr36.htm

Name of subject	Electrical mechanics (ECTS 4)
Subject/module code	ELMEX2304
Science taught semester (s).	3 rd semester
Responsible teacher	Saodullayev Abror Saypullayevich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-120. Audience Training hours - 48. Lecture training hour – 24 Laboratory training hour –0 Practical training hour – 24 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching this subject: The aim of the course is to teach students the structure and principles of operation of Electrical mechanics, their selection, operation, analysis of the physical processes occurring in them, calculation of the energy efficiency of Electrical mechanics, and formation and development of the design thinking of Electrical mechanics, teaching them to clearly state their opinions and conclusions in a well-founded manner, and to develop the skills to apply them in practice. The task of the subject is to teach students how to construct switching circuits for Electrical mechanics and determine their parameters, calculate and analyze the characteristics of Electrical mechanics, evaluate various operating modes of Electrical mechanics, control Electrical mechanics and adjust their speeds; design Electrical mechanics, and teach them the basic criteria for increasing and ensuring the efficiency of Electrical mechanics. Learning outcomes: 1.The student studies the nature of electromechanical phenomena in nature and technology of Electrical mechanics through the fundamental concepts of the science of Electrical mechanics. 2.The student studies the structure, operating principle, applications and characteristics of transformers. 3.The student studies the structure, operating principle, applications and characteristics of alternating current machines. 4.The student studies the structure, operating principle, applications and characteristics of direct current machines.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: Physical processes occurring in transformers. Magnetic cores of transformers and the structure of magnetic cores. Electromagnetic processes occurring in no-load and short-circuit modes of the transformer. Topic 2: EYUK and currents in transformer windings. Conversion of electrical parameters of the secondary winding of a transformer to the number of windings of the primary winding. Transformer T-shaped switching schemes and vector diagrams. Topic 3: Transformatorning tashqi tavsifi. Kuchlanishni rostlash. Transformator chulg‘amlari ulanish guruhlari. Parallel ulash shartlari. Topic 4: Parts and diagrams of the stator winding of alternating current machines. Magnetic motive forces (MMF) and magnetic fields. Pulsating, elliptical and circular rotating magnetic fields. Topic 5: Types of asynchronous machines, their structure and operating principle. Operating modes of an asynchronous machine. Topic 6: Vector diagrams of an induction machine. Energy diagram

of an induction machine. Electromagnetic (rotating) torque and mechanical characteristics of an induction machine.

Topic 7: Description of the operation of an induction motor. Starting an induction motor. Adjusting the rotation frequency of an induction motor. Induction generator, electromagnetic processes in it and their characteristics.

Topic 8: Modern series and special types of induction machines. Induction frequency converter.

Topic 9: Types of synchronous generators, structure and operating principle of synchronous machines. Types of excitation of synchronous generators. Armature reaction.

Topic 10: Parallel connection of a synchronous machine to an electrical network. Synchronization methods. Structure and principle of operation of a synchronous motor. Operating characteristics of a synchronous motor.

Topic 11: DC machine. The structure of DC machines and the principle of operation as generators. Characteristics of DC generators.

Topic 12: The structure of DC motors and physical processes in motors. Starting DC motors. Methods of adjusting the speed of DC motors.

II. Instructions and recommendations for practical training

The department will develop instructions and recommendations for organizing practical training. In it, students will further enrich the knowledge and skills they have acquired on the main lecture topics through practical problems and cases. It is also recommended to consolidate students' knowledge based on textbooks and manuals, use handouts, increase students' knowledge by publishing scientific articles and theses, solve problems, prepare presentations and visual aids on topics, use regulatory legal documents, etc.

Recommended practice topics:

1.Determination of the main parameters of a single-phase toroidal transformer;

2.Determination of the connection group of single- and three-phase transformer windings. Determination of the parameters of single-phase toroidal and Scott transformers for short-circuiting and short-circuiting;

3.Determination of the voltage drop of a transformer operating with a load. Determination of the parameters of autotransformers;

4.Check the conditions for parallel connection of transformers;

5.Starting an asynchronous motor using an additional resistance;

6.Determination of the parameters of a repulsion electric motor;

7.Solving problems related to methods for adjusting the rotation frequency of an asynchronous motor. Determination of the parameters of capacitor electric motors;

8.Calculation of the capacitances of the working and starting capacitors for connecting a three-phase asynchronous motor to a single-phase network;

9.Construction of the adjustment characteristic of a synchronous generator. Construction of the external characteristic of a synchronous generator;

10.Construction of the U-shaped characteristic of a synchronous generator. Construction of the angular characteristic of a synchronous generator;

11.External characteristics of DC generators;

12.Calculation of parameters of multifunctional DC motors
Calculation of mechanical characteristics of an DC motor;

III. Independent learning 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. Independent study for the recommended topics: 1.Transformers by operating modes. 2.Types of special transformers. 3.General issues of alternating current machines. 4.Special asynchronous machines. 5.Special synchronous machines. 6.Special DC machines. 7.Calculation of the main parameters of the transformer based on experimental data. 8.Construction of a characteristic of the transformer in the case of sudden and short-circuit operation; 9.Construction of an external and adjusting characteristic of the transformer; 10.Calculation of the useful efficiency of the transformer depending on its power; 11.Checking the conditions for parallel connection of transformers; 12.Starting an asynchronous motor using additional resistance; 13.Determination of the operating characteristics of an asynchronous motor using a circular diagram of currents; 14.Accurate calculation of the mechanical characteristics of an asynchronous motor; 15.Calculation of the working and starting capacitor capacities for connecting a three-phase asynchronous motor to a single-phase network; 16.Construction of the Potye diagram of a synchronous generator; 17.Construction of the adjustment characteristic of a synchronous generator; 18.Calculation of power losses in DC machines; 19.Switching in DC machines; 20.Determination of the main parameters of an DC motor;
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.Salimov J.S., Pirmatov N.B. Elektr mashinalari.– T.:				

O'zbekiston faylasuflari milliy jamiyati nashriyoti, 2011. –408 b.

2.Mustafakulova G.N., Toirov O.Z., Bekishev A.E. Elektr mashinalari. Toshkent.: Tafakkur avlodi. 2020. 191 b.

3.Majidov S. Elektr mashinalari va elektr yuritma. - T.: O'qituvchi, 2002. -358 b.

4.S. K. Sahdev/Electrical Machines/ © Cambridge University Press 2018

5.Testing of Power Transformers under participation of ° Carlson Ake Jitka Fuhr Gottfried Schemel Franz Wegscheider 1st Edition published by Pro Print GmbH, Düsseldorf ISBN 3-00-010400-3-2003.

6.Alimxodjayev K.T., Pirmatov N.B., Ziyoxodjayev T.I. Elektr mashinalari.- T.: “Fan va texnologiya”, 2018. -344 b.

7.Alimxodjayev K.T., Pirmatov N.B., Ziyoxodjayev T.I., Mustafakulova G.N. Elektr mashinalari va transformatorlarning ekspluatatsiyasi. - T.: “Fan va texnologiya”, 2019. -240 b.

8.Копылова И.П. Электрические машины: Учебник для бакалавр – Москва:. Юрайт, 2012. – 675 с.

9.Иванов – Смоленский А.В. Электрические машины. В 2-х т. Учебник для вузов.– М.: Изд-воМЭИ, 2004. Том. 1 – 652 с, Том 2 – 532 с.

10.Salimov J.S., Pirmatov N.B., Bekchanov B.E. Transformatorlar va avtotransformatorlar. T.: “VEKTOR-PRESS”, 2010.-224 b.

11.N.B.Pirmatov, A.S.Saodullayev, A.Y.Bekishev, N.A.Qurbonov «Elektr mashinalari» o'quv qo'llanma O'zbekiston Respublikasi Oliy va o'rta-maxsus ta'lim vazirligi. – Toshkent: «ZEBO PRINT» nashriyoti. 2022.-197 b.

12.A.Saodullayev, U.Mirzayev «Elektr mashinalari fanidan tajriba mashg'ulotlarini bajarishga oid uslubiy ko'rsatma» Jizzax-2022. JizPI nashriyoti, 60 b.

Additional literature:

13.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.

14.Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini ta'minlash – yurt taraqqiyoti va xalq farovonligining garovi. O'zbekiston Respublikasi Konstitusiyasi qabul qilinganining 24 yilligiga bag'ishlangan tantanali marosimdagi ma'ruza 2016 yil 7 dekabr. – T.: “O'zbekiston” NMIU, 2016. – 48 b.

15.Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – T.: “O'zbekiston” NMIU, 2017. – 488 b.

16.O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. – T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.

17.Pirmatov N.B., Yarmuxamyedova Z.A., Mustafakulova G.N. Elyektr mashinalari fanining transformatorlar qismi bo'yicha kurs loyihasini bajarishga oid o'quv-myetodik qo'llanma. –T.: ToshDTU, 2012 – 117 b.

18.Кацман М.М. Сборник задач по электрическим машинам. Учеб. Пособие для вузов. –Москва.: – Издательский центр «Академия». 2012. –154 с.

19.Mustafakulova G.N., Toshev Sh.E. Elektr mashinalari fanidan laboratoriya mashg'ulotlarini bajarish uchun metodik ko'rsatma. –T.: TDTU, 2015. – 45 b.

20.Pirmatov N.B., Zayniyeva O.E. Elektromexanika (Elektr

	mashinalari) fanidan masalalar to‘plami. O‘quv qo‘llanma. –T.: TDTU, 2004. – 75 b.

Internet resources:

21.www.ziyonet.uz

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

23.http://rbip.bookchamber.ru/description.aspx?product_no=854;

24.<http://energy-mgn.nm.ru/progr36.htm>

Subject name	Automated systems for accounting and control of electricity consumption (ECTS 4)
Topic/module code	RENER2304
Semesters in which the subject is taught	3 rd semester
Adjunct teacher	Baratov Laziz Suyun ugli, assistant.
Language of instruction	Uzbek
Connection to the curriculum	Elective
Study hours (including independent study)	Total hours - 120 . Classroom hours - 48. Lecture hours - 24 Laboratory hours - 12 Practical hours - 12 Independent learning - 72 hours
ECTS	4
The purpose and objectives of science / learning outcomes	The aim of teaching the subject is to develop students' skills in the concept of Automated systems for accounting and control of electricity consumption and the implementation of Automated systems for accounting and control of electricity consumption technologies in the power supply system. At the same time, it is to comprehensively study smart grids and digital substations in the power system. The task of the subject is to comprehensively teach students about Automated systems for accounting and control of electricity consumption and its application in the power supply system, to develop skills in using digital devices in the process of automatic control and accounting of energy consumption in the power supply system, and to comprehensively teach all issues related to the basic concepts, economic and technical calculations of Automated systems for accounting and control of electricity consumption. Learning outcomes: 1. To study the prospects for the introduction of Automated systems for accounting and control of electricity consumption technologies in the power supply system. 2. To study in detail smart grids and digital substations in the power system 3. To study the state policy in the energy sector and its development trends and prospects in the country and the world. 4. To economically assess the competitiveness of traditional and unconventional methods of electricity generation. 5. To have a complete picture of the equipment and devices of power grids and systems.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: History and classification of Automated systems for accounting and control of electricity consumption development. Concept and types of Automated systems for accounting and control of electricity consumption. History of Automated systems for accounting and control of electricity consumption development. Current status of application of digital technologies in the power supply system. Digital technologies in the power supply system. Topic 2: Digital regulation and standardization of electric energy. Topic 3: Principles of creation and construction of automatic control systems in the power system. Topic 4: Introduction of SCADA systems in the power system Topic 5: Organization of a data processing system in the power system. Topic 6: Development of the principles of Smart-grid, micro-grid in

electric energy.

Topic 7: Digitalization of the fuel and energy complex. Digital oil and gas industry. Automated systems for accounting and control of electricity consumption industry.

Topic 8: Energy accounting - the role of a green economy in energy saving.

Topic 9: Technical and software tools of an automated system

Topic 10: Control of the quality of electric energy using an automated system. Main quantities characterizing the quality of electricity

Topic 11: Digital technologies in energy. Digital services. Application of analytical services.

Topic 12: Digital transformation in energy. The concept of digital transformation in energy. Intelligent systems and their structural structure.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, 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:

1. Familiarization with the automated system of control and accounting of electricity.
2. Study of Automated system for monitoring and accounting of electrical energy in the energy system of Uzbekistan.
3. Study of modern electricity meters.
4. Study of data collection and processing in Automated system for monitoring and accounting of electrical energy software.
5. Study of technical means of Automated system for monitoring and accounting of electrical energy.
6. Study and analysis of Automated system for monitoring and accounting of electrical energy at the level of power plants.

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with the study of 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 training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of a practical training is to understand the theory, acquire skills. It is to develop the ability to consciously apply it in educational and professional activities, to confidently form one's own point of view.

Recommended practical topics:

1. Energy based on non-traditional renewable energy sources.
2. Smart grids.
3. Dispatching engineering systems of the electric power industry. SCADA.
4. Automated systems of electric power.
5. Automated lighting control
6. Transition to a digital substation. Communication protocols in the electric power industry.

IV. Independent learning 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. Independent study for the recommended topics: 1. Electrical efficiency calculation programs 2. Energy based on non-traditional renewable energy sources. 3. Description of the systematic scheme of the process from energy production to its consumption 4. Transition to a digital substation. Communication protocols in the electric power industry 5. Use of digital technology structures in industrial enterprises 6. Digital transformation in energy 7. Digital regulation and standardization of electric power 8. Study of modern electricity meters. 9. Study and analysis of EENHAT at the level of power plants. 10. Systems ensuring the cyber security of the substation in the formation of a digital structure. 11. Energy accounting is a means of energy saving. 12. Control of the quality of electricity using an automated system.
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. Steven W.Blume. Electric Power System Basics. USA.: Wiley – InterscienceA John Wiley&Sous, INC Publication, 2007, 260 p 2. Saidxodjaev A.G. Shahar elektr ta'minoti. Darslik. – T.: Fan-tehnologiya, 2015. 3. Козлов В.А. Электроснабжение городов. Учебник. -Л.: «Энергоатомиздат», 1988г. -263ст. 4. Ополева Г.Н. Схемы и подстанции электроснабжения: Справочник: Учебное пособие. – М.: ФОРУМ: ИНФРА-М, 2006. – 480 ст. 5. Холянов В.С., Холянова О.М. «Электроснабжение непромышленных объектов». Учебное пособие – М.: Владивосток, 2007. 6. Qodirov T.M., Alimov X.A., Rafikova G.R. Sanoat korxonalari va fuqaro binolarining elektr ta'minoti. O'quv qo'llanma. –Toshkent: 2007. -190 bet. 7. Qodirov T.M. Alimov X.A. «Sanoat korxonalarining				

elektr ta'minoti» O'quv qo'llanma, ToshDTU. -T.: 2006. -210 bet.

8. Taslimov A.D., Meliqo'ziyev M.V. "Shahar elektr ta'minoti", O'quv qo'llanma, ToshDTU. -T.: 2022. -200 bet.

Additional literature:

9. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.

10. Конюхова Е.А. Электроснабжение объектов: Учебное пособие. -М: Изд «Мастерство», 2001.

11. Козлов В.А. и др.- Электроснабжение городов. Справочник. - Л.: «Энергатииздат».1999.

12. Ершов А.М. Системы электроснабжения, часть 5. Курс лекций -М.: Челябинск 2017, 190 ст.

13. Сазыкин В.Г. Проектирование систем электроснабжения. / Учебное пособие. –Краснодар, -М.: 2019,120ст.

Internet resources:

16. www.ziynet.uz – milliy o'quv materiallarini qidiruv sayti.

17. www.gov.uz – O'zbekiston Respublikasining hukumat portali.

17. www.google.com – xalqaro o'quv materiallarini qidiruv sayti.

19. www.energystrategy.ru – "Energetika siyosati va strategiyasi" axborot portali

20. www.twirpx.com – xalqaro o'quv materiallarini qidiruv sayti.

Subject name	Digital Energy (ECTS 4)
Topic/module code	RENER2304
Semesters in which the subject is taught	3 rd semester
Adjunct teacher	Baratov Laziz Suyun ugli, assistant.
Language of instruction	Uzbek
Connection to the curriculum	Elective
Study hours (including independent study)	Total hours - 120 . Classroom hours - 48. Lecture hours - 24 Laboratory hours - 12 Practical hours - 12 Independent learning - 72 hours
ECTS	4
The purpose and objectives of science / learning outcomes	The aim of teaching the subject is to develop students' skills in the concept of digital energy and the implementation of digital energy technologies in the power supply system. At the same time, it is to comprehensively study smart grids and digital substations in the power system. The task of the subject is to comprehensively teach students about digital energy and its application in the power supply system, to develop skills in using digital devices in the process of automatic control and accounting of energy consumption in the power supply system, and to comprehensively teach all issues related to the basic concepts, economic and technical calculations of digital energy. Learning outcomes: 1. To study the prospects for the introduction of digital energy technologies in the power supply system. 2. To study in detail smart grids and digital substations in the power system 3. To study the state policy in the energy sector and its development trends and prospects in the country and the world. 4. To economically assess the competitiveness of traditional and unconventional methods of electricity generation. 5. To have a complete picture of the equipment and devices of power grids and systems.
Course content (topics)	I. Main theoretical part (Lecture) Topic 1: History and classification of digital energy development. Concept and types of digital energy. History of digital energy development. Current status of application of digital technologies in the power supply system. Digital technologies in the power supply system. Topic 2: Digital regulation and standardization of electric energy. Topic 3: Principles of creation and construction of automatic control systems in the power system. Topic 4: Introduction of SCADA systems in the power system Topic 5: Organization of a data processing system in the power system. Topic 6: Development of the principles of Smart-grid, micro-grid in electric energy. Topic 7: Digitalization of the fuel and energy complex. Digital oil and gas industry. Digital energy industry. Topic 8: Energy accounting - the role of a green economy in energy saving. Topic 9: Technical and software tools of an automated system Topic 10: Control of the quality of electric energy using an automated system. Main quantities characterizing the quality of electricity

Topic 11: Digital technologies in energy. Digital services. Application of analytical services.

Topic 12: Digital transformation in energy. The concept of digital transformation in energy. Intelligent systems and their structural structure.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, 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:

1. Familiarization with the automated system of control and accounting of electricity.
2. Study of Automated system for monitoring and accounting of electrical energy in the energy system of Uzbekistan.
3. Study of modern electricity meters.
4. Study of data collection and processing in Automated system for monitoring and accounting of electrical energy software.
5. Study of technical means of Automated system for monitoring and accounting of electrical energy.
6. Study and analysis of Automated system for monitoring and accounting of electrical energy at the level of power plants.

III. Instructions and recommendations for practical training

The teacher's preparation for a practical training begins with the study of 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 training, the amount of work that each student must perform.

Methodological instructions are the main methodological document of the teacher in preparing and conducting practical training.

The purpose of a practical training is to understand the theory, acquire skills. It is to develop the ability to consciously apply it in educational and professional activities, to confidently form one's own point of view.

Recommended practical topics:

1. Energy based on non-traditional renewable energy sources.
2. Smart grids.
3. Dispatching engineering systems of the electric power industry. SCADA.
4. Automated systems of electric power.
5. Automated lighting control
6. Transition to a digital substation. Communication protocols in the electric power industry.

IV. Independent learning 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.

Independent study for the recommended topics:

1. Electrical efficiency calculation programs
2. Energy based on non-traditional renewable energy sources.
3. Description of the systematic scheme of the process from energy production to its consumption
4. Transition to a digital substation. Communication protocols in the electric power industry

	5. Use of digital technology structures in industrial enterprises 6. Digital transformation in energy 7. Digital regulation and standardization of electric power 8. Study of modern electricity meters. 9. Study and analysis of EENHAT at the level of power plants. 10. Systems ensuring the cyber security of the substation in the formation of a digital structure. 11. Energy accounting is a means of energy saving. 12. Control of the quality of electricity using an automated system.
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. Steven W.Blume. Electric Power System Basics. USA.: Wiley – InterscienceA John Wiley&Sous, INC Publication, 2007, 260 p 2. Saidxodjaev A.G. Shahar elektr ta'minoti. Darslik. – T.: Fan-tehnologiya, 2015. 3. Козлов В.А. Электроснабжение городов. Учебник. -Л.: «Энергоатомиздат», 1988г. -263ст. 4. Ополева Г.Н. Схемы и подстанции электроснабжения: Справочник: Учебное пособие. – М.: ФОРУМ: ИНФРА-М, 2006. – 480 ст. 5. Холянов В.С., Холянова О.М. «Электроснабжение непромышленных объектов». Учебное пособие – М.: Владивосток, 2007. 6. Qodirov T.M., Alimov X.A., Rafikova G.R. Sanoat korxonalari va fuqaro binolarining elektr ta'minoti. O'quv qo'llanma. –Toshkent: 2007. -190 bet. 7. Qodirov T.M. Alimov X.A. «Sanoat korxonalarining elektrta'minoti» O'quv qo'llanma, ToshDTU. -T.: 2006. -210 bet. 8. TaslimovA.D., Meliqo'ziyevM.V. “Shahar elektr ta'minoti”, O'quv qo'llanma, ToshDTU. -T.: 2022. -200 bet. Additional literature: 9. O'zbekiston Respublkasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 10. Конюхова Е.А. Электроснабжение объектов: Учебное пособие. -М: Изд «Мастерство», 2001.				

	11. Козлов В.А. и др.- Электроснабжение городов. Справочник. - Л.: «Энергатииздат».1999. 12. Ершов А.М. Системы электроснабжения, часть 5. Курс лекций -М.: Челябинск 2017, 190 ст. 13. Сазыкин В.Г. Проектирование систем электроснабжения. / Учебное пособие. –Краснодар, -М.: 2019,120ст. Internet resources: 16. www.ziyonet.uz – milliy o‘quv materiallarini qidiruv sayti. 17. www.gov.uz – O‘zbekiston Respublikasining hukumat portali. 17. www.google.com – xalqaro o‘quv materiallarini qidiruv sayti. 19. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali 20. www.twirpx.com – xalqaro o‘quv materiallarini qidiruv sayti.

Name of subject	Electrical Networks and Systems (ECTS 8)
Subject/module code	ETT24508
Science taught semester (s).	4 th and 5 th semesters
Responsible teacher	Abdullaev Elnur Akhmatovich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240 Audience Training hours - 96 Lecture training hour – 48 Laboratory training hour – 24 Practical training hour – 24 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to teach students the parameters and conditions of electrical networks, master the methods of calculating and analyzing the conditions of electrical networks and systems, teach the basics of designing the development of electrical systems, teach measures to increase the economy of electrical networks, and familiarize them with the structural and mechanical parts of overhead power lines and teach the basics of their calculation. The task of the subject is to teach students how to construct switching schemes for elements of electrical networks and determine their parameters, calculate the electrical states of open and closed electrical networks of varying complexity, characterize the operating states of electrical networks and systems and their assessment, control and adjustment in electrical networks and systems; design electrical networks, and the main criteria for improving and ensuring the efficiency of electrical networks. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the role and socio-economic significance of electric power in society. 3. Study the state policy of the energy sector and its development trends and prospects in the country and the world. 4. Study the basic concepts and principles in the field of energy networks and systems. 5. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation. 6. Get a complete picture of the equipment and devices of electric networks and systems. 7. Gain knowledge and skills in the design of electric networks.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of science. System of accepted basic definitions. The role of energy networks and systems in the transition of the Republic of Uzbekistan to a "green" economy Topic 2: Structure of power lines. General information about overhead lines. Wires and cables of overhead lines. Supports of overhead lines. Function of all-important equipment in power distribution networks. Topic 3: Insulators and line fittings. Cable structure and cable lines. Topic 4: Switching schemes and calculation parameters of power transmission lines. Determination of comparative parameters of power transmission lines. Estimation and modeling of parameters

Topic 5: Two-winding transformer replacement diagram, catalog and calculation parameters

Topic 6: Three-winding transformer switching diagram, catalog and calculation parameters. Autotransformer switching diagram, catalog and calculation parameters. Characteristic characteristics of the autotransformer. Nominal and type capacities of the autotransformer.

Topic 7: Consumer loads. Static characteristics of consumer loads. Categories of consumers. Basic aspects of design and measurement of electrical systems

Topic 8: Calculation of the state of the power transmission line given the load current and voltage. Vector diagram of the power transmission line current and voltage. Simplified methods for calculating voltage

Topic 9: Calculation of the electricity transmission network state when the load power and voltage are given. Calculation of the electricity transmission network state when the load power and source voltage are given. Two-stage method. Calculation of the open network states consisting of several electricity transmission networks connected in series and with known load powers.

Topic 10: Three-winding transformers. Switching diagram and its parameters. Transformers with separate windings.

Topic 11: Calculation of power flows in simple closed electrical networks with and without losses.

Topic 12: Calculation of power and voltage distribution in networks supplied from both sides. Calculation of power flows in networks supplied from both sides, taking into account losses. Calculation of voltage distribution in networks supplied from both sides.

Topic 13: The importance of ensuring active power balance in the electrical system. Frequency deviation and oscillation in the electrical system. Permissible frequency deviation value. Frequency adjustment in turbines. Automatic frequency unloader. Frequency adjustment in the electrical system.

Topic 14: Reactive power balance in the electrical system and its relationship to voltage. Load balancing effect. Reactive power consumers. Ensuring reactive power balance in network design.

Topic 15: Tasks of reactive power compensation in the electrical network. The effect of reactive power compensation on energy and voltage losses. Reactive power compensators.

Topic 16: Application of a systems approach and optimization in reactive power compensation. Advantages and disadvantages of a capacitor bank as a compensator. Reactive power generated by a capacitor bank. Advantages and disadvantages of reactors as compensators. Static sources of reactive power.

Topic 17: Quality indicators of electric energy. Normalized values of voltage deviation. The impact of quality indicators of electric energy on the effective operation of the network and consumers. Technological damage caused by violations of quality indicators of electric energy.

Topic 18: Three-winding transformer switching diagram, catalog and calculation parameters. Autotransformer switching diagram, catalog and calculation parameters. Characteristic characteristics of the autotransformer. Nominal and type capacities of the autotransformer.

Topic 19: Voltage stabilization, single-phase and multi-phase regulation. Local and centralized voltage regulation. Reverse voltage regulation. Voltage regulation in power plants.

Topic 20: Voltage regulation using a automatic adjustment of the excitation transformer. Voltage regulation using a adjust under load transformer. Schemes and principles of operation of automatic adjustment of the excitation and adjust under load devices. Voltage regulation using line rectifier transformers.

Topic 21: Adjusting the voltage by changing the network resistance. Determining the resistance of the longitudinal compensation device required to adjust the voltage. Adjusting the voltage by changing the reactive power flow.

Topic 22: Methods of designing an electric network. Main technical and economic indicators. Issues of designing the development of an electric network. Main technical and economic indicators. Selection of the nominal voltage of an electric network.

Topic 23: Compare electricity network options in terms of capital investment and additional costs. Compare electricity network options in terms of costs incurred. Consider the level of reliability when comparing options. Select the nominal voltage when designing an electricity network.

Topic 24: Selection of cross-sectional areas of conductors according to economic current density. The concept of economic current density. Advantages and disadvantages of the method.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies 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. Study of normal states of an electrical system. Creation of models for electrical equipment.
2. Study of operating conditions of long power lines.
3. Calculation of the normal state of an electrical network using the Gauss-Seidel method.
4. Calculation of the normal state of an electrical network using the Newton-Raphson method.
5. Reactive power compensation in electrical networks
6. Adjusting voltage in electrical networks by changing the transformation coefficient of transformers
7. Adjusting voltage in electrical networks by changing the resistance of the electrical network.
8. Adjusting the voltage in electrical networks by changing the reactive power of the electrical network.
9. Reducing waste in electrical networks.
10. Increasing the efficiency of electrical network operations.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Construction of equivalent circuit diagrams of electricity transmission network and two-winding transformers and finding calculation parameters.
2. Construct equivalent circuit diagrams of three-phase transformers and autotransformers and find calculation parameters.

	3. Calculation of open electrical network conditions 4. Calculation of the electricity transmission network state with known load power (current) and voltage at the end. Calculation of the electricity transmission network state with known load power (current) and voltage at the beginning. 5. Calculation of open electrical network conditions with known load capacities and voltage at the supply node. 6. Voltage regulation at step-down substations. 7. Choosing the nominal voltage of the electrical network. 8. Selection of the cross-section of the electricity transmission network conductor based on economic current density, economic intervals, and permissible voltage modes. 9. Calculation of power and energy waste in electricity transmission network. 10. Calculation of power and energy losses in the line based on the load graph. 11. Determining power and energy losses in a transformer based on load graphs. 12. Measures to reduce power and energy waste in electrical networks. IV. Coursework instructions and recommendations The following topics are recommended for the course project: 1. Design of the power transmission scheme of the hydroelectric power plant. 2. Design of the power transmission scheme of the thermal power plant. 3. Design of the power transmission scheme of the thermal power center. V. Independent learning 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. Calculation and analysis of highly complex electrical network conditions. 2. Circular vector diagrams of power transmission line parameters. 3. Calculation of the distribution of power flows in homogeneous closed electrical networks by dividing them into circuits. 4. Electrical load graphs. 5. Construction of equivalent circuit diagrams of EUL and transformers and finding calculation parameters. 6. Calculation of electrical network conditions. 7. Simple and complicated substances and importance. 8. Power and energy waste in electrical networks. 9. Reactive power compensation in electrical networks. 10. Selection of power line conductors. 11. Modeling operating conditions of electrical networks using computer programs, developing practical skills.
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		

	<table><tr><td rowspan="2">Midterm assessment</td><td rowspan="2">20 points</td><td>Supervision: Written work</td><td>10 points</td><td rowspan="2">12 points</td></tr><tr><td>System tasks</td><td>10 points (divided by the number of tasks)</td></tr><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* 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.</td></tr></table>	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.				
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* 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. Elektr tarmoqlari va tizimlari: O‘quv qo‘llanma/ A.M. Safarov, T.Sh. G‘oyibov, A.X. Sulliyev. O‘zbekiston Respublakasi Oliy va o‘rta maxsus ta’lim vazirligi. Toshkent. Tafakkur bo‘stoni. 2013.-224 b. 2. Gayibov T.Sh. Elektr tarmoqlari va tizimlari. O‘quv qo‘llanma. – T.: «Voriz-nashriyot». 2010. 3. T.Sh. Gayibov., B.M. Pulatov., A.E. Shanazarov. “Elektr tarmoqlari va tizimlari. Misol va masalalar to‘plami”. O‘quv qo‘llanma. –Toshkent., ToshDTU, 2021-175 b. 4. T.Sh. Gayibov, H.F. Shamsutdinov, B.M. Pulatov Elektr tarmoqlari va tizimlari fanidan kurs loyihasini bajarish uchun uslubiy qo‘llanma. – Toshkent: ToshDTU, 2015-57 b. 5. Electric Power Systems/ B.M.Weedy, B.J.Cory, N.Jenkins, J.B.Ekanayake, G.Strbac.- 5th ed., UK, A John Wiley and Sons, 2012. 6. Duncan Glover, Mulucutla s. Sarma, Thomas J. Overbye. Power System Analysis and Design/Fifth edetion.- Australia, Brazil, Japan, United Kingdom, USA. CANGAGE Learning. 2010. 7. Arthur R. Bergen/ Power Systems Analysis / 2000. 8. Elektr tarmoqlari va sistemalari: uslubiy qo‘llanma/ O‘zR OO‘MTV; Rasulov A.N., Taslimov A.D., Mamarasulova F.S., Raxmonov I.U.– Toshkent: TDTU, 2014.- 90 b. Additional literature: 9. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 10. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati’yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b 3. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”. 4. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 13. Лыпкин А.В. Электрические системы и сети (Электронный ресурс): (учеб. пособ.)– Новосибирск: Изд-во НГТУ, 2002.-248 с 14. Электрические системы и сети. Буслова Н.В., Винославский В.Н., Данисенко Т.И., Перхач В.С. Под ред. Данисенко Г. – Киев: Высшая школа, 2006. 15. Блок В.М. Электрические сети и системы. Высшая школа, 2006. Internet resources: 16. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. 17. www.ziynet.uz – national educational materials search site. 18. www.gov.uz – Government portal of the Republic of Uzbekistan.																	

	19. www.google.com – international educational materials search site. 20. www.energystrategy.ru – “Energy Policy and Strategy” information portal 21. www.twirpx.com – international educational materials search site.

Name of subject	Electrical networks of power supply systems (ECTS 8)
Subject/module code	ETTET24508
Science taught semester (s).	4 th and 5 th semester
Responsible teacher	Abdullaev Elnur Akhmatovich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240. Audience Training hours - 120. Lecture training hour – 48 Laboratory training hour – 24 Practical training hour – 24 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to teach students the parameters and conditions of electrical networks, master the methods of calculating and analyzing the conditions of Power supply of power supply systems, teach the basics of designing the development of electrical systems, teach measures to increase the economy of electrical networks, and familiarize them with the structural and mechanical parts of overhead power lines and teach the basics of their calculation. The task of the subject is to teach students how to construct switching schemes for elements of electrical networks and determine their parameters, calculate the electrical states of open and closed electrical networks of varying complexity, characterize the operating states of Power supply of power supply systems and their assessment, control and adjustment in Power supply of power supply systems; design electrical networks, and the main criteria for improving and ensuring the efficiency of electrical networks. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the role and socio-economic significance of electric power in society. 3. Study the state policy of the energy sector and its development trends and prospects in the country and the world. 4. Study the basic concepts and principles in the field of energy networks and systems. 5. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation. 6. Get a complete picture of the equipment and devices of electric networks and systems. 7. Gain knowledge and skills in the design of electric networks.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of science. System of accepted basic definitions. The role of energy networks and systems in the transition of the Republic of Uzbekistan to a "green" economy Topic 2: Structure of power lines. General information about overhead lines. Wires and cables of overhead lines. Supports of overhead lines. Function of all-important equipment in power distribution networks. Topic 3: Insulators and line fittings. Cable structure and cable lines. Topic 4: Switching schemes and calculation parameters of power transmission lines. Determination of comparative parameters of power transmission lines. Estimation and modeling of parameters Topic 5: Two-winding transformer replacement diagram, catalog and

calculation parameters

Topic 6: Three-winding transformer switching diagram, catalog and calculation parameters. Autotransformer switching diagram, catalog and calculation parameters. Characteristic characteristics of the autotransformer. Nominal and type capacities of the autotransformer.

Topic 7: Consumer loads. Static characteristics of consumer loads. Categories of consumers. Basic aspects of design and measurement of electrical systems

Topic 8: Calculation of the state of the power transmission line given the load current and voltage. Vector diagram of the power transmission line current and voltage. Simplified methods for calculating voltage

Topic 9: Calculation of the electricity transmission network state when the load power and voltage are given. Calculation of the electricity transmission network state when the load power and source voltage are given. Two-stage method. Calculation of the open network states consisting of several electricity transmission networks connected in series and with known load powers.

Topic 10: Three-winding transformers. Switching diagram and its parameters. Transformers with separate windings.

Topic 11: Calculation of power flows in simple closed electrical networks with and without losses.

Topic 12: Calculation of power and voltage distribution in networks supplied from both sides. Calculation of power flows in networks supplied from both sides, taking into account losses. Calculation of voltage distribution in networks supplied from both sides.

Topic 13: The importance of ensuring active power balance in the electrical system. Frequency deviation and oscillation in the electrical system. Permissible frequency deviation value. Frequency adjustment in turbines. Automatic frequency unloader. Frequency adjustment in the electrical system.

Topic 14: Reactive power balance in the electrical system and its relationship to voltage. Load balancing effect. Reactive power consumers. Ensuring reactive power balance in network design.

Topic 15: Tasks of reactive power compensation in the electrical network. The effect of reactive power compensation on energy and voltage losses. Reactive power compensators.

Topic 16: Application of a systems approach and optimization in reactive power compensation. Advantages and disadvantages of a capacitor bank as a compensator. Reactive power generated by a capacitor bank. Advantages and disadvantages of reactors as compensators. Static sources of reactive power.

Topic 17: Quality indicators of electric energy. Normalized values of voltage deviation. The impact of quality indicators of electric energy on the effective operation of the network and consumers. Technological damage caused by violations of quality indicators of electric energy.

Topic 18: Three-winding transformer switching diagram, catalog and calculation parameters. Autotransformer switching diagram, catalog and calculation parameters. Characteristic characteristics of the autotransformer. Nominal and type capacities of the autotransformer.

Topic 19: Voltage stabilization, single-phase and multi-phase regulation. Local and centralized voltage regulation. Reverse voltage regulation. Voltage regulation in power plants.

Topic 20: Voltage regulation using a automatic adjustment of the excitation transformer. Voltage regulation using a adjust under load transformer. Schemes and principles of operation of automatic adjustment of the excitation and adjust under load devices. Voltage regulation using line rectifier transformers.

Topic 21: Adjusting the voltage by changing the network resistance.

Determining the resistance of the longitudinal compensation device required to adjust the voltage. Adjusting the voltage by changing the reactive power flow.

Topic 22: Methods of designing an electric network. Main technical and economic indicators. Issues of designing the development of an electric network. Main technical and economic indicators. Selection of the nominal voltage of an electric network.

Topic 23: Compare electricity network options in terms of capital investment and additional costs. Compare electricity network options in terms of costs incurred. Consider the level of reliability when comparing options. Select the nominal voltage when designing an electricity network.

Topic 24: Selection of cross-sectional areas of conductors according to economic current density. The concept of economic current density. Advantages and disadvantages of the method.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory exercises, students develop practical skills and competencies in various indicators of processes in Power supply of power supply 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. Study of normal states of an electrical system. Creation of models for electrical equipment.
2. Study of operating conditions of long power lines.
3. Calculation of the normal state of an electrical network using the Gauss-Seidel method.
4. Calculation of the normal state of an electrical network using the Newton-Raphson method.
5. Reactive power compensation in electrical networks
6. Adjusting voltage in electrical networks by changing the transformation coefficient of transformers
7. Adjusting voltage in electrical networks by changing the resistance of the electrical network.
8. Adjusting the voltage in electrical networks by changing the reactive power of the electrical network.
9. Reducing waste in electrical networks.
10. Increasing the efficiency of electrical network operations.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Construction of equivalent circuit diagrams of electricity transmission network and two-winding transformers and finding calculation parameters.
2. Construct equivalent circuit diagrams of three-phase transformers and autotransformers and find calculation parameters.
3. Calculation of open electrical network conditions

	4. Calculation of the electricity transmission network state with known load power (current) and voltage at the end. Calculation of the electricity transmission network state with known load power (current) and voltage at the beginning. 5. Calculation of open electrical network conditions with known load capacities and voltage at the supply node. 6. Voltage regulation at step-down substations. 7. Choosing the nominal voltage of the electrical network. 8. Selection of the cross-section of the electricity transmission network conductor based on economic current density, economic intervals, and permissible voltage modes. 9. Calculation of power and energy waste in electricity transmission network. 10. Calculation of power and energy losses in the line based on the load graph. 11. Determining power and energy losses in a transformer based on load graphs. 12. Measures to reduce power and energy waste in electrical networks. IV. Coursework instructions and recommendations The following topics are recommended for the course project: 1. Design of the power transmission scheme of the hydroelectric power plant. 2. Design of the power transmission scheme of the thermal power plant. 3. Design of the power transmission scheme of the thermal power center. V. Independent learning 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. Calculation and analysis of highly complex electrical network conditions. 2. Circular vector diagrams of power transmission line parameters. 3. Calculation of the distribution of power flows in homogeneous closed electrical networks by dividing them into circuits. 4. Electrical load graphs. 5. Construction of equivalent circuit diagrams of EUL and transformers and finding calculation parameters. 6. Calculation of electrical network conditions. 7. Simple and complicated substances and importance. 8. Power and energy waste in electrical networks. 9. Reactive power compensation in electrical networks. 10. Selection of power line conductors. 11. Modeling operating conditions of electrical networks using computer programs, developing practical skills.
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		

	<table><tr><td rowspan="2">Midterm assessment</td><td rowspan="2">20 points</td><td>Supervision: Written work</td><td>10 points</td><td rowspan="2">12 points</td></tr><tr><td>System tasks</td><td>10 points (divided by the number of tasks)</td></tr><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* 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.</td></tr></table>	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.				
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Recommended Literature	Main literature: 1. Elektr tarmoqlari va tizimlari: O‘quv qo‘llanma/ A.M. Safarov, T.Sh. G‘oyibov, A.X. Sulliyev. O‘zbekiston Respublakasi Oliy va o‘rta maxsus ta‘lim vazirligi. Toshkent. Tafakkur bo‘stoni. 2013.-224 b. 2. Gayibov T.Sh. Elektr tarmoqlari va tizimlari. O‘quv qo‘llanma. – T.: «Voriz-nashriyot». 2010. 3. T.Sh. Gayibov., B.M. Pulatov., A.E. Shanazarov. “Elektr tarmoqlari va tizimlari. Misol va masalalar to‘plami”. O‘quv qo‘llanma. –Toshkent., ToshDTU, 2021-175 b. 4. T.Sh. Gayibov, H.F. Shamsutdinov, B.M. Pulatov Elektr tarmoqlari va tizimlari fanidan kurs loyihasini bajarish uchun uslubiy qo‘llanma. – Toshkent: ToshDTU, 2015-57 b. 5. Electric Power Systems/ B.M.Weedy, B.J.Cory, N.Jenkins, J.B.Ekanayake, G.Strbac.- 5th ed., UK, A John Wiley and Sons, 2012. 6. Duncan Glover, Mulucutla s. Sarma, Thomas J. Overbye. Power System Analysis and Design/Fifth edition.- Australia, Brazil, Japan, United Kingdom, USA. CANGAGE Learning. 2010. 7. Arthur R. Bergen/ Power Systems Analysis / 2000. 8. Elektr tarmoqlari va sistemalari: uslubiy qo‘llanma/ O‘zR OO‘MTV; Rasulov A.N., Taslimov A.D., Mamarasulova F.S., Raxmonov I.U.– Toshkent: TDTU, 2014.- 90 b. Additional literature: 9. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 10. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati‘yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b 3. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”. 4. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 13. Лыпкин А.В. Электрические системы и сети (Электронный ресурс): (учеб. пособ.)– Новосибирск: Изд-во НГТУ, 2002.-248 с 14. Электрические системы и сети. Буслова Н.В., Винославский В.Н., Данисенко Т.И., Перхач В.С. Под ред. Данисенко Г. – Киев: Высшая школа, 2006. 15. Блок В.М. Электрические сети и системы. Высшая школа, 2006. Internet resources: 16. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. 17. www.ziynet.uz – national educational materials search site. 18. www.gov.uz – Government portal of the Republic of Uzbekistan.																	

	19. www.google.com – international educational materials search site. 20. www.energystrategy.ru – “Energy Policy and Strategy” information portal 21. www.twirpx.com – international educational materials search site.

Name of subject	Power supply of power supply systems (ECTS 8)
Subject/module code	ETT24508
Science taught semester (s).	4 th and 5 th semester
Responsible teacher	Abdullaev Elnur Akhmatovich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240. Audience Training hours - 120. Lecture training hour – 48 Laboratory training hour – 24 Practical training hour – 24 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to teach students the parameters and conditions of electrical networks, master the methods of calculating and analyzing the conditions of Power supply of power supply systems, teach the basics of designing the development of electrical systems, teach measures to increase the economy of electrical networks, and familiarize them with the structural and mechanical parts of overhead power lines and teach the basics of their calculation. The task of the subject is to teach students how to construct switching schemes for elements of electrical networks and determine their parameters, calculate the electrical states of open and closed electrical networks of varying complexity, characterize the operating states of Power supply of power supply systems and their assessment, control and adjustment in Power supply of power supply systems; design electrical networks, and the main criteria for improving and ensuring the efficiency of electrical networks. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the role and socio-economic significance of electric power in society. 3. Study the state policy of the energy sector and its development trends and prospects in the country and the world. 4. Study the basic concepts and principles in the field of energy networks and systems. 5. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation. 6. Get a complete picture of the equipment and devices of electric networks and systems. 7. Gain knowledge and skills in the design of electric networks.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of science. System of accepted basic definitions. The role of energy networks and systems in the transition of the Republic of Uzbekistan to a "green" economy Topic 2: Structure of power lines. General information about overhead lines. Wires and cables of overhead lines. Supports of overhead lines. Function of all-important equipment in power distribution networks. Topic 3: Insulators and line fittings. Cable structure and cable lines. Topic 4: Switching schemes and calculation parameters of power transmission lines. Determination of comparative parameters of power transmission lines. Estimation and modeling of parameters Topic 5: Two-winding transformer replacement diagram, catalog and

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Topic 6: Three-winding transformer switching diagram, catalog and calculation parameters. Autotransformer switching diagram, catalog and calculation parameters. Characteristic characteristics of the autotransformer. Nominal and type capacities of the autotransformer.

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Topic 9: Calculation of the electricity transmission network state when the load power and voltage are given. Calculation of the electricity transmission network state when the load power and source voltage are given. Two-stage method. Calculation of the open network states consisting of several electricity transmission networks connected in series and with known load powers.

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In laboratory exercises, students develop practical skills and competencies in various indicators of processes in Power supply of power supply systems, conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions.

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1. Construction of equivalent circuit diagrams of electricity transmission network and two-winding transformers and finding calculation parameters.
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	4. Calculation of the electricity transmission network state with known load power (current) and voltage at the end. Calculation of the electricity transmission network state with known load power (current) and voltage at the beginning. 5. Calculation of open electrical network conditions with known load capacities and voltage at the supply node. 6. Voltage regulation at step-down substations. 7. Choosing the nominal voltage of the electrical network. 8. Selection of the cross-section of the electricity transmission network conductor based on economic current density, economic intervals, and permissible voltage modes. 9. Calculation of power and energy waste in electricity transmission network. 10. Calculation of power and energy losses in the line based on the load graph. 11. Determining power and energy losses in a transformer based on load graphs. 12. Measures to reduce power and energy waste in electrical networks. IV. Coursework instructions and recommendations The following topics are recommended for the course project: 1. Design of the power transmission scheme of the hydroelectric power plant. 2. Design of the power transmission scheme of the thermal power plant. 3. Design of the power transmission scheme of the thermal power center. V. Independent learning 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. Calculation and analysis of highly complex electrical network conditions. 2. Circular vector diagrams of power transmission line parameters. 3. Calculation of the distribution of power flows in homogeneous closed electrical networks by dividing them into circuits. 4. Electrical load graphs. 5. Construction of equivalent circuit diagrams of EUL and transformers and finding calculation parameters. 6. Calculation of electrical network conditions. 7. Simple and complicated substances and importance. 8. Power and energy waste in electrical networks. 9. Reactive power compensation in electrical networks. 10. Selection of power line conductors. 11. Modeling operating conditions of electrical networks using computer programs, developing practical skills.
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	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		

	<table><tr><td rowspan="2">Midterm assessment</td><td rowspan="2">20 points</td><td>Supervision: Written work</td><td>10 points</td><td rowspan="2">12 points</td></tr><tr><td>System tasks</td><td>10 points (divided by the number of tasks)</td></tr><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* 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.</td></tr></table>	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.				
Midterm assessment	20 points			Supervision: Written work	10 points		12 points											
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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. Elektr tarmoqlari va tizimlari: O‘quv qo‘llanma/ A.M. Safarov, T.Sh. G‘oyibov, A.X. Sulliyev. O‘zbekiston Respublakasi Oliy va o‘rta maxsus ta’lim vazirligi. Toshkent. Tafakkur bo‘stoni. 2013.-224 b. 2. Gayibov T.Sh. Elektr tarmoqlari va tizimlari. O‘quv qo‘llanma. – T.: «Voriz-nashriyot». 2010. 3. T.Sh. Gayibov., B.M. Pulatov., A.E. Shanazarov. “Elektr tarmoqlari va tizimlari. Misol va masalalar to‘plami”. O‘quv qo‘llanma. –Toshkent., ToshDTU, 2021-175 b. 4. T.Sh. Gayibov, H.F. Shamsutdinov, B.M. Pulatov Elektr tarmoqlari va tizimlari fanidan kurs loyihasini bajarish uchun uslubiy qo‘llanma. – Toshkent: ToshDTU, 2015-57 b. 5. Electric Power Systems/ B.M.Weedy, B.J.Cory, N.Jenkins, J.B.Ekanayake, G.Strbac.- 5th ed., UK, A John Wiley and Sons, 2012. 6. Duncan Glover, Mulucutla s. Sarma, Thomas J. Overbye. Power System Analysis and Design/Fifth edetion.- Australia, Brazil, Japan, United Kingdom, USA. CANGAGE Learning. 2010. 7. Arthur R. Bergen/ Power Systems Analysis / 2000. 8. Elektr tarmoqlari va sistemalari: uslubiy qo‘llanma/ O‘zR OO‘MTV; Rasulov A.N., Taslimov A.D., Mamarasulova F.S., Raxmonov I.U.– Toshkent: TDTU, 2014.- 90 b. Additional literature: 9. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 10. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati‘yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b 3. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”. 4. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 13. Лыпкин А.В. Электрические системы и сети (Электронный ресурс): (учеб. пособ.)– Новосибирск: Изд-во НГТУ, 2002.-248 с 14. Электрические системы и сети. Буслова Н.В., Винославский В.Н., Данисенко Т.И., Перхач В.С. Под ред. Данисенко Г. – Киев: Высшая школа, 2006. 15. Блок В.М. Электрические сети и системы. Высшая школа, 2006. Internet resources: 16. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. 17. www.ziyonet.uz – national educational materials search site. 18. www.gov.uz – Government portal of the Republic of Uzbekistan.																	

	19. www.google.com – international educational materials search site. 20. www.energystrategy.ru – “Energy Policy and Strategy” information portal 21. www.twirpx.com – international educational materials search site.

Name of subject	Fundamentals of financial literacy (ECTS 4)
Subject/module code	MSA2504
Science taught semester (s).	5 th semester
Responsible teacher	Rasulov Shavkat Sharof ugli, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours - 120. Audience Training hours - 48. Lecture training hour - 24 Practical training hour - 24 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject: is the formation of knowledge, skills and competencies suitable for orientation in students on financial, Financial Policy, Financial Relations, Financial Management, Financial theories, financial infrastructure, financial news, cash flow movement, periodic value of money and discounted analysis of cash flows, financial statements, financial activities of state and non-state financial institutions, financial risks, small business finance, startup financing, insurance, international financial relations and other similar financial concepts. The task of science is to expose students to the role and importance of Science in human life and society through theoretical knowledge, practical skills, a methodological approach to financial phenomena and processes and the formation of a scientific worldview. Learning outcomes: 1. Learn how to earn money, find it and manage money effectively. 2. Learning personal finance and personal financial planning. 3. Home accounting: the study of the use of assets and liabilities, optimization of income and expenses. 4. Learning to manage savings and investments, savings terms and risks on them. 5. Analysis of the concept, signs, types and conditions of credit. 6. Study of accounting and cash transactions. 7. Study financial fraud and measures against them.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction to the science of “fundamentals of financial literacy”. Money, ways to find it and manage money effectively. Topic 2: Personal finance and personal financial planning. Topic 3: Home accounting: the use of assets and liabilities, optimization of income and expenses. Topic 4: Savings and investment, terms of savings and risk management on them. Topic 5: The concept of credit, signs, types and conditions. Topic 6: Accounting and cash transactions. Topic 7: Investments Topic 8: Financial fraud and measures against them. II. Practical training instructions and recommendations The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Introduction to the science of “fundamentals of financial literacy”. Money, ways to find it and manage money effectively.
2. Personal finance and personal financial planning.
3. Home accounting: the use of assets and liabilities, optimization of income and expenses.
4. Savings and investment, terms of savings and risk management on them.
5. The concept of credit, signs, types and conditions.
6. Accounting and cash transactions.
7. Financial fraud and measures against them.

III. Independent learning 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. Find money, its essence, types, money.
2. Cost planning, ways to manage money efficiently.
3. The concept of personal finance, methods of its study.
4. Personal financial planning.
5. Human capital. The use and application of one's own human capital.
6. Decisions, its types, making decisions, determining the goal, finding and choosing alternatives, choosing the optimal option.
7. How to make decisions related to money? Drawing up a personal financial plan.
8. Determination of financial purpose. Choosing alternative methods of achieving the goal. Choosing a strategy for achieving a financial goal.
9. Use the concept of accounting. Assets and liabilities in the household, their essence and composition. Effective use of assets and liabilities. Accounting of assets and liabilities.
10. The composition of the types of income and the procedure for their formation, sources of income.
11. Cost, cost structure, their accounting, cost optimization.
12. Use compilation of the budget of the farm, compliance of income and expenses.
13. The purpose and importance of saving money, ways of saving.
14. The concept of inflation, the reasons for its origin. Calculation of inflation.
15. The concept of deposit (Deposit), its advantages and disadvantages.
16. Banking concept and types of banking. Opening deposit accounts in banks. Features of deposits (deposits).
17. The concept of credit, signs, types and conditions.
18. Repayment of the loan and its provision.
19. Errors that are allowed to reduce the value of the loan and when using the loan.
20. Storage, exchange and transfer of money. The importance of a Bank yacht.

	21.The procedure and conditions for the implementation of transfers. Commission for a transfer, factors affecting its size. 22.Currency exchange procedure. 23.Bank cards, their use. Ensuring the reliability of transactions with a Bank card. 24.The essence and significance of a debit card and a credit card. 25.The concept of financial fraud and its types. 26.Risks to Bank cards. The procedure for protecting Bank cards. 27.Fraud with loans. 28.Fraud with investments. Financial pyramid and its signs. 29.Measures taken in case of fraud. 30.Different methods of net investment projects and fraud schemes.
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. Боди З., Мертон Р. Финансы. Учебник. Пер. с англ. - М.: "Вильямс", 2007. 2. Malikov T., Olimjonov O. Moliya. Darslik. - T.: "Iqtisod-moliya", 2019. - 920 b. 3. Malikov T. Moliya. O'quv qo'llanma. - T.: "Iqtisod-moliya", 2018. -274 b. 4. Malikov T. Byudjet-soliq siyosati. Darslik. - T.: "Iqtisod-moliya", 2019. - 404 b. 5. Nurmuhamedova B. Davlat byudjeti. O'quv qo'llanma. - T.: "Iqtisod-moliya", 2018. - 576 b. 6. Маркина Е.В. Финансы. Учебник. - М.: "КноРус", 2020. 7. Sultonov Sh., Chinqulov Q., G'ofurova U., Safarova N. Biznes moliyasi. O'quv qo'llanma. - T.: "Iqtisod-moliya", 2019. - 358 bet. 8. J. R Zaynolov, S.S. Aliyeva, Z.O. Axrorov. Moliya: Korxonalar moliyasi. Darslik. T.: Iqtisodiyot-Moliya. 2018.-268 b. 9. Финансы. Под редакцией проф. Романовского М.В. Учебник. 5-е. издание. М.: Юрайт. 2016, -554 с. 10. Fozilchayev Sh., Xidirov N. Moliyaviy risklar nazariyasi. O'quv qo'llanma. -T.: "Iqtisod moliya", 2019. - 240 b. Additional literature: 11. O'zbekiston Respublikasi Prezidentining 2017 yil 20 apreldagi "Oliy ta'lim tizimini yanada rivojlantirish chora-tadbirlari to'g'risida"gi 2909-sonli Qarori. 12. O'zbekiston Respublikasi Prezidentining 2017 yil 27 iyuldagi				

“Oliy ma’lumotli mutaxassislar tayyorlash sifatini oshirishda iqtisodiyot sohalari va tarmoqlarining ishtirokini yanada kengaytirish chora-tadbirlari to’g’risida”gi 3151-sonli Qarori.

13. O‘zbekiston Respublikasi Prezidentining 2021 yil 24 dekabrda “Davlat oliy ta’lim muassasalarining akademik va tashkiliy-boshqaruv mustaqilligini ta’minlash bo’yicha qo’shimcha chora-tadbirlar to’g’risida”gi PQ-60-sonli Qarori.

14. O‘zbekiston Respublikasi Prezidentining 2021 yil 24 dekabrda “Davlat oliy ta’lim muassasalariga moliyaviy mustaqillik berish chora-tadbirlari to’g’risida”gi PQ-61-sonli Qarori.

15. Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – T.: “O‘zbekiston” NMIU, 2017. - 488 b.

16. Mirziyoyev Sh.M. Tanqidiy tahlil, qat’iy tartib-intizom va shaxsiy javobgarlik - har bir rahbar faoliyatining kundalik qoidasi bo’lishi kerak. – T.: “O‘zbekiston” NMIU, 2017. - 104 b.

17. Mirziyoyev Sh.M. Erkin va farovon, demokratik O‘zbekiston davlatini birgalikda barpo etamiz. – T.: “O‘zbekiston” NMIU, 2017. - 56 b.

18. Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini ta’minlash - yurt taraqqiyoti va xalq farovonligining garovi. – T.: “O‘zbekiston” NMIU, 2017. - 48 b.

19. Mirziyoyev Sh.M. Yangi O‘zbekiston demokratik o‘zgarishlar, keng imkoniyatlar va amaliy ishlar mamlakatiga aylanmoqda. – T.: “O‘qituvchi” MU, 2021. - 184 b.

20. Mirziyoyev Sh.M. Yangi O‘zbekiston strategiyasi. – T.: “O‘zbekiston” nashriyoti. – 464 b.

21. Bodi Z., Merton R.S., Cleeton D.L. Textbook. Financial economics. New Jersey: “Pearson Education”, 2016. – 500 p.

22. Барулин С.В. Финансы. Учебник. – М.: “КноРус”, 2017. - 640 с.

23. Mehmonov S., Karimova Z., Tursunov A. Byudjet tizimi. Darslik. – T.: “Iqtisod-moliya”, 2018. – 544 b.

24. Нешиной А.С. Учебник. – М.: “Дашков и К”. 2018. - 352 с.

25. Романовский М.В., Врублевская О.В. Финансы. Учебник. - М.: “Юрайт”, 2013. -599 с.

26. Tashmuhamedova D. Byudjet g’azna ijrosi. O’quv qo’llanma. - T.: “Iqtisod-moliya”, 2019. - 440 b.

27. Шапкин А.С., Шапкин В.А. Экономические и финансовые риски. Оценка, управление, портфель инвестиций. Учебник. - М.: “Дашков и Ко”, 2016. - 546 с.

28. Abduraxmonov I. Sug’urta nazariyasi va amaliyoti. O’quv qo’llanma. - T.: “Iqtisod-moliya”, 2017. - 416 b.

Internet resources:

29. www.gov.uz - O‘zbekiston Respublikasining hukumat portali.

30. www.lex.uz - O‘zbekiston Respublikasi Qonun hujjatlari milliy bazasi.

31. www.mf.uz - O‘zbekiston Respublikasi Iqtisodiyot va moliya vazirligi rasmiy sayti.

32. www.cbu.uz - O‘zbekiston Respublikasi Markaziy banki rasmiy sayti.

33. www.stat.uz - O‘zbekiston Respublikasi milliy statistika qo‘mitasi rasmiy sayti.

34. www.soliq.uz - O‘zbekiston Respublikasi Davlat Soliq qo‘mitasi rasmiy sayti.

34. www.openbudget.uz - O‘zbekiston Respublikasi “Ochiq byudjet” portali.

35. www.scopus.com - xalqaro ilmiy ma’lumotlar bazasi.

Name of subject	Investment and innovation (ECTS 4)
Subject/module code	II2504
Science taught semester (s).	5 th semester
Responsible teacher	Rasulov Shavkat Sharof ugli, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours - 120. Audience Training hours - 48. Lecture training hour - 24 Practical training hour - 24 Independent education -72 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching science is to develop knowledge, skills and competencies in students corresponding to the direction of economic content of investments, forms of investment attraction, sources of investment financing, formation of a state development program, financing investment projects and assessing their effectiveness, venture financing of innovations, assessment of the country's innovation activities. The task of the science is to teach its researchers theoretical and practical knowledge on the economic content of investments and its importance in the development of micro and macroeconomics, the correct Organization of investment policies of economic entities, the assessment of the economic efficiency of investment projects, the specifics of sources and methods of financing investment projects in continuity and continuity. Learning outcomes: 1. They must have knowledge of the role and importance of foreign investment in the international integration of the economy. 2. Knowledge of the role of free economic areas in attracting investments in the economy is necessary. 3. When financing investments, they need to have an idea and knowledge of financial instruments. 4. Mortgage lending in investment activities, the concept of innovation and innovative activities, the fact that investments aimed at innovation have knowledge and imagination, can independently think creatively, apply knowledge to practice. 5. The development of high-tech industries is able to apply knowledge about the basis of the modernization of the economy. 6. They should know about the factors affecting the development of an innovative economy, understand the essence of the topics, be able to apply theoretical information on practical keys, problem situation, solution of issues.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: economic content and essence of investments, content and main stages of investment processes; Topic 2: investment activities and investment policy, the role of foreign investment in the development of the economy; Topic 3: the role of foreign investment in the international integration of the economy and the regulation of their international movement, the role of free economic regions in attracting investments in the economy; Topic 4: the role and importance of private investment in the development of the economy and its real sector, the role of the investment environment in the development of investment activities;

Topic 5: formation and financing of state programs of capital construction, development in investment activities;

Topic 6: assessment of the financial and economic efficiency of investment projects, sources and methods of financing investment activities;

Topic 7: Financial Instruments in investment financing, lending of investment activities;

Topic 8: leasing mechanism of investment financing, project financing of investments;

Topic 9: financing innovation activities, venture financing of innovative projects;

Topic 10: assessment of the country's innovation activities, financing mobilizing investments in intangible assets;

Topic 11: investment risks and ways to lower them.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. economic content and essence of investments, content and main stages of investment processes;

2. Investment activities and investment policy, the role of foreign investment in the development of the economy;

3. The role of foreign investment in the international integration of the economy and the regulation of their international movement, the role of free economic regions in attracting investments in the economy;

4. The role and importance of private investment in the development of the economy and its real sector, the role of the investment environment in the development of investment activities;

5. Formation and financing of state programs of capital construction, development in investment activities;

6. Assessment of the financial and economic efficiency of investment projects, sources and methods of financing investment activities;

7. Financial instruments in financing investments, lending of investment activities;

8. leasing mechanism of investment financing, project financing of investments;

9. Financing innovation activities, venture financing of innovative projects;

10. Evaluation of the country's innovation activities, financing of investments mobilized in intangible assets;

11. Investment risks and ways to lower them.

III. Independent learning 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. Relationship between investment and savings;

2. Investment goals and stages;
3. Micro and macroeconomic importance of investment activities in the development of the country's economy;
4. The importance of intellectual investment in the development of the economy;
5. Participants, object and subjects of investment activities;
6. The main directions of state investment policy;
7. Investment activities and infrastructure;
8. Important conditions for the development of investment activities;
9. Legal basis for the development of investment activities;
10. The importance of regulating investment activities in the development of the national economy;
11. Direction of investment in the real sector of the economy;
12. The importance of investments in the development of the economy of Uzbekistan;
13. Features of investment projects carried out at the expense of centralized investments;
14. Ensuring the effectiveness of the activities of joint ventures with foreign investment;
15. Impact of interest policy on the development of investment activities;
16. The impact of small business and private entrepreneurship on the revitalization of investment activities;
17. World experience in attracting investments and opportunities for its application in Uzbekistan;
18. Investments aimed at increasing the economic potential of the regions;
19. Issues of state support for investment.
20. Development of investment attraction in priority sectors of the economy;
21. Impact of globalization processes on investment development;
22. Influence of the inflation index on the effectiveness of investments;
23. Impact of tax policy on the development of investment activities;
24. Organization of tenders in the implementation of investment projects;
25. The impact of nominal and real interest rates on investment decision making;
26. Centralized and decentralized capital investments;
27. Impact of inflation processes on the assessment of investment projects;
28. Economic efficiency of capital investments and ways to determine it;
29. Financing of investment projects at the expense of decentralized investments;
30. Real sector of the economy attracting foreign investment in financing enterprises;
31. The role and importance of international financial institutions in financing investment activities;
32. Role of commercial banks in the development of the securities market;
33. Features of syndicated lending of investment projects;
34. Problems of development of syndication lending of large investment projects in Uzbekistan;
35. Influence of the inflation index on the effectiveness of investments;
36. Risk insurance in the implementation of investment projects;
37. Risks in the implementation of investment projects and their

	management; 38. Issues of using a leasing loan in investment; 39. Analysis of conflicting and competitive investment projects; 40. Financial analysis of the borrower's activities; 41. Analysis and assessment of the liquidity and creditworthiness of the borrower; 42. Analysis of investment projects in Risk conditions; 43. Sources of financing investment projects and issues of its optimization; 44. The procedure for financing projects on account of foreign loans; 45. Financing investment projects at the expense of credit lines of international financial institutions; 46. Issues of financing innovative projects; 47. Mechanism of financing investment projects from the budget; 48. Prospects for financing investments at the expense of venture capital.
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. A.U.Burxanov, Sh.X.Muminov, X.X.Xudoyqulov. Investitsiya va innovatsiyalar. – T.: «Innovatsion rivojlanish nashriyot-matbaa uyi», 2021. - 462 b. 2. Zoyirov L.S, Asamxodjayeva Sh.Sh, Yunusova S.B. Investitsiya. Darslik. - T.: Iqtisod-moliya, 2019. – 652 b. 3. Зайиров Л.С, Насиров Э.И, Ханова Н.Ф, Асамходжаева Ш.Ш. Инвестиции. Учебное пособие. – Т.: Иқтисод-молия, 2019. – 448 с. 4. Зайиров Л.С, Ханова Н.Ф. Инвестиции. Учебник. – Т.: Иқтисод-молия, 2019. 5. Nasirov E.I., Asamxodjayeva Sh.Sh. Investitsiya loyihalarini moliyalashtirish. Darslik. – T.: Iqtisod-moliya, 2020. 6. Сабирова Л.Ш., Хужамкулов Д.Ю. Инвестиция. Учебное пособие. - Т.: Иқтисод-молия, 2019.- 254 с. 7. Xujamkulov D.Yu., Ismailov D.A. Investitsiya loyihalarini boshqarish. O'quv qo'llanma. – T.: TDIU, 2019. 296 b. 8. Asamxodjayeva Sh., Ochilov B. “Investitsiya va innovatsiyalar” fanidan O'quv-uslubiy majmua. T.: TMI, 2022. 395 bet				

Additional literature:

9. O‘zbekiston Respublikasi Vazirlar Mahkamasining 2021 yil 20 maydagi “Kapital qurilish sohasida buyurtmachi xizmati faoliyatini tubdan isloh qilish chora-tadbirlari to‘g‘risida”gi VMQ-321-sonli qarori.

10. O‘zbekiston Respublikasi Prezidentining 2021 yil 1 apreldagi “Ilm-fan sohasidagi davlat siyosati va innovatsion rivojlantirishdagi davlat boshqaruvini yanada takomillashtirish chora-tadbirlari to‘g‘risida”gi PQ-5047-sonli qarori.

Internet resources:

11. www.lex.uz – O‘zbekiston Respublikasi Qonun hujjatlari ma’lumotlari milliy bazasi.

12. www.ziynet.uz – Jamoat axborot ta’lim tarmog‘i sayti.

13. <https://gov.uz/oz/miit> - O‘zbekiston Respublikasi Investitsiyalar, sanoat va savdo vazirligi sayti.

14. <https://innovation.gov.uz/> - O‘zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi huzuridagi Innovatsion rivojlanish agentligi sayti.

15. www.stat.uz - O‘zbekiston Respublikasi milliy Statistika Qo‘mitasi sayti.

Name of subject	Alternative energy sources in the power supply system (ECTS 8)
Subject/module code	ETTMEM24508
Science taught semester (s).	4 th and 5 th semesters
Responsible teacher	Suyarov Anvar Olimjon ugli, assistant.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240 Audience Training hours – 96 Lecture training hour – 36 Practical training hour – 60 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop an understanding of renewable energy sources in students, analyze the share of renewable energy sources in the world's electricity generation capacity, develop skills and qualifications in the classification and structural structure of the electric power industry, electricity generation processes, and the effective operation of electrical devices under specific operating conditions. The task of the subject is to The role of the electric power industry in the rapid development of the economy is incomparable. Due to the stable operation of the energy system of Uzbekistan, the national economy is provided with uninterrupted and high-quality electric energy. This process, in turn, increases the demand for training highly qualified personnel. This program reflects the goals and objectives, content of the discipline “Alternative energy sources in the power supply system”. In-depth study of the science of alternative energy sources in the power supply system plays an important role in solving the problems of the harmful effects of energy on the environment. Learning outcomes: 1. Studies the development, history, and prospects of renewable energy sources and the electric power system. 2. The role and socio-economic significance of alternative energy in society. 3. State policy in the energy sector and its development trends and prospects in the country and the world. 4. Basic concepts in the electric power sector. 5. Key performance indicators for various types of transport and opportunities for their improvement. 6. Increasing the efficiency of electricity generation equipment. 7. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. Opportunities for the use of renewable energy sources. Analysis of the opportunities for the use of renewable energy sources in the energy system Topic 2: Regulatory and legal framework for the use of renewable energy sources in the energy system of Uzbekistan. History of the development of the energy sector of Uzbekistan. Renewable energy sources, their types and resources. Prospects and stages of development of the use of renewable energy resources in the territory of Uzbekistan. Topic 3: The role of renewable energy sources in the transition of the

Republic of Uzbekistan to a "green" economy.

Topic 4: Hydropower.

Large natural and artificial subsystems that serve to convert the energy of water flows into electrical energy.

Hydropower plants, their types, principle of operation

Topic 5: Hydroelectric power plants and small hydroelectric power plants.

The principle and function of operation of hydroelectric power plants (HPP). HPP operating modes. Small hydroelectric power plants and their operating processes. Advantages of small hydroelectric power plants

Topic 6: Solar thermal systems

Conversion of sunlight energy into thermal energy of water. Flat-plate solar collectors. Use of solar thermal systems. Efficient use of solar energy. Parabolic trough solar power plants. High-temperature solar devices. Solar furnaces.

Topic 7: Conversion of solar energy into electrical energy.

Photoelectric effect phenomenon. Structural scheme of zones in semiconductors. p-n junction, layout schemes of p-n junctions in a semiconductor crystal. Volt-ampere classifications of semiconductor materials and solar photovoltaic panels. Solar photovoltaic power plants, Solar thermodynamic power plants

Topic 8. Wind power plants and power stations

Existing SHES in developed countries. Future prospects of SHES. Wind power plants. Wind energy resources map. Future prospects of wind power plants.

Topic 9: Selection and use of wind power equipment

Electric generators and their selection, selection of electric drives, selection of a place for installing a wind electric motor. Analysis of biomass energy resources and their use indicators.

Topic 10: Biomass energy sources and their use

General information about biomass sources. Processes of converting biomass into useful energy. Converting biomass into useful energy in thermal and chemical processes.

Modern bioenergy devices, their structure and principle of operation. Scheme of the working process of a biomass device. Methods of pyrolysis, alcohol production. Production of biogas using anaerobic digestion. Biomass energy resources resources.

Topic 11: Geothermal energy sources and their use

Use of geothermal energy. Types of geothermal power plants. Scales of geothermal energy use and their impact on the environment

Installation of hydrothermal power plants in hyperthermal areas. Scheme of heat recovery from dry rock. Heat source from hydrothermal resources.

Topic 12: Geothermal power plant using geothermal heat

Cycles for generating electricity from geothermal heat. Scheme of a geothermal power plant with a low boiling point. Geothermal power plant using natural steam directly.

Topic 13: Use of ocean wave energy

Ocean wave energy, reactive converters of ocean wave energy, hydroelectric power station on ocean wave energy.

Topic 14: Use of tidal energy of seas and oceans

Tidal energy of seas and oceans, wave energy device, wave power station, tidal power station scheme.

Topic 15: Environmental aspects of the use of renewable energy sources.

The impact of geothermal energy, solar power plants, wind power plants on the environment. The impact of small hydropower, hydroelectric power plants, biomass energy, ocean energy on the

environment.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation and comparison of the economic efficiency of renewable energy power plants around the world.
2. Calculation of the parameters of a hydroelectric dam and a hydroturbine.
3. Study of the volt-ampere and volt-watt characteristics of a solar cell
4. Series connection of solar cells.
5. Parallel connection of solar cells.
6. Calculation and selection of a photovoltaic module for a solar power plant.
7. Calculation of the type and number of accumulator batteries.
8. Calculation of the prices of selected basic equipment for a solar power plant for an individual house.
9. Study of the structure and principle of operation of a vacuum tube solar collector.
10. Measurement of the parameters of water heated in a flat solar collector and determination of its thermal efficiency.
11. Calculation of a wind power plant. Selection and calculation of a wind power plant generator.
12. Calculation of the volume and heat of a biogas plant reactor.
13. Calculation of thermal power taking into account the use of geothermal heat.

III. Independent learning 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 and importance of renewable energy in the fuel and energy complex of Uzbekistan.
2. Prospects for the use of renewable energy in the energy sector of the world and Uzbekistan.
3. Trends in the development of renewable energy in Uzbekistan.
4. Use of solar energy in energy supply systems. Technical characteristics of solar installations. Climatic advantages for the construction of solar installations.
5. Main technical schemes of solar installations. Their technical and economic indicators.
6. Production of electricity as a result of the photovoltaic effect.
7. Heliothermal technology for converting solar energy.
8. Wind power. Main directions and technical characteristics of the development of wind power plants.
9. General characteristics and development directions of wind power in

	Uzbekistan. 10. Bioenergy. Main technical schemes of bioenergy plants. 11. Main directions of the development of bioenergy in Uzbekistan. 12. Technical, socio-economic and environmental problems in the system of waste processing technologies. 13. Geothermal energy. The main technical and economic conditions for its development. 14. Small hydropower plants. Prospects for the construction of small hydropower plants. General description of energy sources and the main technical solutions for their development. 15. Energy of the seas and oceans. General description of energy potential and technical possibilities for its development. 16. Wave and tidal devices. Basic technical characteristics, development prospects. 17. Thermal energy of the seas and oceans. Energy of ocean currents. 18. What problems can be solved in our country using renewable energy? 19. Current status and prospects for the use of renewable energy sources. 20. The role of small hydropower in the development of certain regions of Uzbekistan. 21. The status of renewable energy in Uzbekistan, problems and solutions.
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

tiklanuvchi energiya manbalarini rivojlantirishning tezkor chora-tadbirlari to'g'risida"gi PQ-4422-sonli Qarori.

5. Majidov T.Sh. Noan'anaviy va qayta tiklanuvchi energiya manbalari // Toshkent. 2014.

6. John Twidell and Tony Weir. Renewable Energy Resources // Taylor and Francis Group. LONDON AND NEW YORK, 2006.

7. Renewable Energy // ICAR e-Course For B.Sc (Agriculture) and B.Tech (Agriculture)

8. Риполь-Сарагоси Т.Л., Кууск А.Б. Возобновляемые и нетрадиционные источники энергии. Учебно-методическое пособие // Ростов-на-Дону, 2019. – 122 с.

9. Badalov A.S., Zenkova V.A., Uralov B.R., Shaazizov F.Sh. Hidroelektrostansiyalar. O'quv qo'llanma // Toshkent – 2009.

10. М.М. Мухаммадиев, Б.У. Уришев, Э.К. Мамадиёров, К.С. Джураев Энергетические установки малой мощности на базе возобновляемых источников энергии // Ташкент. ТашГТУ, 2015.- С.161

11. Faleev D.S Osnovnye karakteristiki solnechnykh moduley // Metodicheskaya ukazaniya. Xabarovsk. 2013. – Izdatelstvo DVGUPS. – S.28

12. Gremenok V.F., Tivanov M. S., Zaleski V.B Solar cells based semiconductor materials// International Scientific Journal for Alternative Energy and Ecology – 2009 – Vol.69. №1. – P. 59-124.

Additional literature:

13. Mirziyoev SH.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. - T.: "O'zbekiston" NMIU, 2017. – 488 b.

14. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.

15. O'zbekiston Respublikasini «Energiyadan ratsional foydalanish haqidagi» qonuni 29 aprel 1997yil.

Афанасев В. П., Теруков Э. И., Шерченков А. А Тонкопленочные солнечные элементы на основе кремния // Санкт-Петербург. Издательство СПбГЕТУ «ЛЕТИ» 2011

Internet resources:

13. www.gov.uz – O'zbekiston Respublikasining hukumat portali.

14. www.ziynet.uz – milliy o'quv materiallarining qidiruv sayti.

15. www.lex.uz – 'zbekiston Respublikasining Qonun hujjatlari ma'lumotlari milliy bazasi

Name of subject	Alternative energy sources (ECTS 8)
Subject/module code	ETTMEM24508
Science taught semester (s).	4 th and 5 th semester
Responsible teacher	Suyarov Anvar Olimjon ugli, assistant.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-240. Audience Training hours - 96. Lecture training hour – 36 Practical training hour – 60 Independent education -144 hours
ECTS	8
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop an understanding of renewable energy sources in students, analyze the share of renewable energy sources in the world's electricity generation capacity, develop skills and qualifications in the classification and structural structure of the electric power industry, electricity generation processes, and the effective operation of electrical devices under specific operating conditions. The task of the subject is to The role of the electric power industry in the rapid development of the economy is incomparable. Due to the stable operation of the energy system of Uzbekistan, the national economy is provided with uninterrupted and high-quality electric energy. This process, in turn, increases the demand for training highly qualified personnel. This program reflects the goals and objectives, content of the discipline “Alternative energy sources”. In-depth study of the science of Alternative energy sources plays an important role in solving the problems of the harmful effects of energy on the environment. Learning outcomes: 1. Studies the development, history, and prospects of renewable energy sources and the electric power system. 2. The role and socio-economic significance of alternative energy in society. 3. State policy in the energy sector and its development trends and prospects in the country and the world. 4. Basic concepts in the electric power sector. 5. Key performance indicators for various types of transport and opportunities for their improvement. 6. Increasing the efficiency of electricity generation equipment. 7. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. Opportunities for the use of renewable energy sources. Analysis of the opportunities for the use of renewable energy sources in the energy system Topic 2: Regulatory and legal framework for the use of renewable energy sources in the energy system of Uzbekistan. History of the development of the energy sector of Uzbekistan. Renewable energy sources, their types and resources. Prospects and stages of development of the use of renewable energy resources in the territory of Uzbekistan. Topic 3: The role of renewable energy sources in the transition of the

Republic of Uzbekistan to a "green" economy.

Topic 4: Hydropower.

Large natural and artificial subsystems that serve to convert the energy of water flows into electrical energy.

Hydropower plants, their types, principle of operation

Topic 5: Hydroelectric power plants and small hydroelectric power plants.

The principle and function of operation of hydroelectric power plants (HPP). HPP operating modes. Small hydroelectric power plants and their operating processes. Advantages of small hydroelectric power plants

Topic 6: Solar thermal systems

Conversion of sunlight energy into thermal energy of water. Flat-plate solar collectors. Use of solar thermal systems. Efficient use of solar energy. Parabolic trough solar power plants. High-temperature solar devices. Solar furnaces.

Topic 7: Conversion of solar energy into electrical energy.

Photoelectric effect phenomenon. Structural scheme of zones in semiconductors. p-n junction, layout schemes of p-n junctions in a semiconductor crystal. Volt-ampere classifications of semiconductor materials and solar photovoltaic panels. Solar photovoltaic power plants, Solar thermodynamic power plants

Topic 8. Wind power plants and power stations

Existing SHES in developed countries. Future prospects of SHES. Wind power plants. Wind energy resources map. Future prospects of wind power plants.

Topic 9: Selection and use of wind power equipment

Electric generators and their selection, selection of electric drives, selection of a place for installing a wind electric motor. Analysis of biomass energy resources and their use indicators.

Topic 10: Biomass energy sources and their use

General information about biomass sources. Processes of converting biomass into useful energy. Converting biomass into useful energy in thermal and chemical processes.

Modern bioenergy devices, their structure and principle of operation. Scheme of the working process of a biomass device. Methods of pyrolysis, alcohol production. Production of biogas using anaerobic digestion. Biomass energy resources resources.

Topic 11: Geothermal energy sources and their use

Use of geothermal energy. Types of geothermal power plants. Scales of geothermal energy use and their impact on the environment

Installation of hydrothermal power plants in hyperthermal areas. Scheme of heat recovery from dry rock. Heat source from hydrothermal resources.

Topic 12: Geothermal power plant using geothermal heat

Cycles for generating electricity from geothermal heat. Scheme of a geothermal power plant with a low boiling point. Geothermal power plant using natural steam directly.

Topic 13: Use of ocean wave energy

Ocean wave energy, reactive converters of ocean wave energy, hydroelectric power station on ocean wave energy.

Topic 14: Use of tidal energy of seas and oceans

Tidal energy of seas and oceans, wave energy device, wave power station, tidal power station scheme.

Topic 15: Environmental aspects of the use of renewable energy sources.

The impact of geothermal energy, solar power plants, wind power plants on the environment. The impact of small hydropower, hydroelectric power plants, biomass energy, ocean energy on the

environment.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation and comparison of the economic efficiency of renewable energy power plants around the world.
2. Calculation of the parameters of a hydroelectric dam and a hydroturbine.
3. Study of the volt-ampere and volt-watt characteristics of a solar cell
4. Series connection of solar cells.
5. Parallel connection of solar cells.
6. Calculation and selection of a photovoltaic module for a solar power plant.
7. Calculation of the type and number of accumulator batteries.
8. Calculation of the prices of selected basic equipment for a solar power plant for an individual house.
9. Study of the structure and principle of operation of a vacuum tube solar collector.
10. Measurement of the parameters of water heated in a flat solar collector and determination of its thermal efficiency.
11. Calculation of a wind power plant. Selection and calculation of a wind power plant generator.
12. Calculation of the volume and heat of a biogas plant reactor.
13. Calculation of thermal power taking into account the use of geothermal heat.

III. Independent learning 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 and importance of renewable energy in the fuel and energy complex of Uzbekistan.
2. Prospects for the use of renewable energy in the energy sector of the world and Uzbekistan.
3. Trends in the development of renewable energy in Uzbekistan.
4. Use of solar energy in energy supply systems. Technical characteristics of solar installations. Climatic advantages for the construction of solar installations.
5. Main technical schemes of solar installations. Their technical and economic indicators.
6. Production of electricity as a result of the photovoltaic effect.
7. Heliothermal technology for converting solar energy.
8. Wind power. Main directions and technical characteristics of the development of wind power plants.
9. General characteristics and development directions of wind power in

	Uzbekistan. 10. Bioenergy. Main technical schemes of bioenergy plants. 11. Main directions of the development of bioenergy in Uzbekistan. 12. Technical, socio-economic and environmental problems in the system of waste processing technologies. 13. Geothermal energy. The main technical and economic conditions for its development. 14. Small hydropower plants. Prospects for the construction of small hydropower plants. General description of energy sources and the main technical solutions for their development. 15. Energy of the seas and oceans. General description of energy potential and technical possibilities for its development. 16. Wave and tidal devices. Basic technical characteristics, development prospects. 17. Thermal energy of the seas and oceans. Energy of ocean currents. 18. What problems can be solved in our country using renewable energy? 19. Current status and prospects for the use of renewable energy sources. 20. The role of small hydropower in the development of certain regions of Uzbekistan. 21. The status of renewable energy in Uzbekistan, problems and solutions.
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. 21.05.2019 -yildagi “Qayta tiklanuvchi energiya manbalaridan foydalanish to‘g‘risida”gi O‘zbekiston Respublikasining Qonuni.					
	2. O‘zbekiston Respublikasi Prezidentining 04.10.2019-yildagi “2019 — 2030-yillar davrida O‘zbekiston respublikasining “yashil” iqtisodiyotga o‘tish strategiyasini tasdiqlash to‘g‘risida”gi PQ-4477-sonli Qarori					
	3. O‘zbekiston Respublikasi Prezidentining 26.05.2017-yildagi “2017-2021 yillarda qayta tiklanuvchi energetikani yanada rivojlantirish, iqtisodiyot tarmoqlari va ijtimoiy sohada energiya samaradorligini oshirish chora-tadbirlari dasturi to‘g‘risida”gi PQ-3012-sonli Qarori.					
	4. O‘zbekiston Respublikasi Prezidentining 22.08.2019-yildagi “Iqtisodiyot tarmoqlari va ijtimoiy sohaning energiya samaradorligini oshirish, energiya tejovchi texnologiyalarni joriy etish va qayta					

tiklanuvchi energiya manbalarini rivojlantirishning tezkor chora-tadbirlari to'g'risida"gi PQ-4422-sonli Qarori.

5. Majidov T.Sh. Noan'anaviy va qayta tiklanuvchi energiya manbalari // Toshkent. 2014.

6. John Twidell and Tony Weir. Renewable Energy Resources // Taylor and Francis Group. LONDON AND NEW YORK, 2006.

7. Renewable Energy // ICAR e-Course For B.Sc (Agriculture) and B.Tech (Agriculture)

8. Риполь-Сарагоси Т.Л., Кууск А.Б. Возобновляемые и нетрадиционные источники энергии. Учебно-методическое пособие // Ростов-на-Дону, 2019. – 122 с.

9. Badalov A.S., Zenkova V.A., Uralov B.R., Shaazizov F.Sh. Hidroelektrostansiyalar. O'quv qo'llanma // Toshkent – 2009.

10. М.М. Мухаммадиев, Б.У. Уришев, Э.К. Мамадиёров, К.С. Джураев Энергетические установки малой мощности на базе возобновляемых источников энергии // Ташкент. ТашГТУ, 2015.- С.161

11. Faleev D.S Osnovnye karakteristiki solnechnykh moduley // Metodicheskaya ukazaniya. Xabarovsk. 2013. – Izdatelstvo DVGUPS. – S.28

12. Gremenok V.F., Tivanov M. S., Zaleski V.B Solar cells based semiconductor materials// International Scientific Journal for Alternative Energy and Ecology – 2009 – Vol.69. №1. – P. 59-124.

Additional literature:

13. Mirziyoev SH.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. - T.: "O'zbekiston" NMIU, 2017. – 488 b.

14. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'g'risida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.

15. O'zbekiston Respublikasini «Energiyadan ratsional foydalanish haqidagi» qonuni 29 aprel 1997yil.

Афанасев В. П., Теруков Э. И., Шерченков А. А Тонкопленочные солнечные элементы на основе кремния // Санкт-Петербург. Издательство СПбГЕТУ «ЛЕТИ» 2011

Internet resources:

13. www.gov.uz – O'zbekiston Respublikasining hukumat portali.

14. www.ziynet.uz – milliy o'quv materiallarining qidiruv sayti.

15. www.lex.uz – 'zbekiston Respublikasining Qonun hujjatlari ma'lumotlari milliy bazasi

Name of subject	Application of ECM in Energy (ECTS 5)
Subject/module code	EEHM2505
Science taught semester (s).	5 th semester
Responsible teacher	Burliyev Abdulla Ubaydullaevich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hour - 150. Auditory training hours - 60. Lecture training hour - 30 Practical training hour - 30 Independent education -90 hour
ECTS	5
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to develop students' understanding of electrical power systems. To develop skills in improving knowledge in the field of process analysis and independent modeling using existing models, to form the necessary knowledge, skills and competencies in solving various problems in energy systems using electronic computing machines (ECM), that is, computer technologies, software and modeling methods, to ensure the level of knowledge, skills and experience required by the educational standard, in accordance with the profile of the electrical engineering field. The task of the subject: To achieve this goal, science provides students with theoretical knowledge, practical skills, event and to processes It performs the tasks of forming a methodological approach and scientific worldview. Introducing the capabilities of computers in the energy sector , teaching the use of software tools such as SCADA , AutoCAD , Spreadsheet , MATLAB , developing skills in drawing, modeling and analyzing power supply schemes , teaching the basics of algorithmization and solving practical problems in the C++ programming language , explaining the creation of interface programs for energy systems based on the MTV architecture , preparing for solving logical and linear problems through modeling and calculation, teaching the creation of dialog-mode programs and their application in the energy environment. Learning outcomes: 1. Application of exposure in energy and his/her relevance understanding; Such as SCADA, AutoCAD, Spreadsheet, MATLAB and C++ main software tools with work to take; 3. Electricity supply schemes design and modeling complete to take; 4. Energetic issues for algorithms fix takes and to the program turn to take; 5. Linear and complicated issues matrices using using Spreadsheet or MATLAB to solve use to take; 6. C++ programming language through branching and recurring algorithms program to take; 7. MTV model based on energetic systems programming projects working come out to take; 8. Energetic systems for user interfaces create and them from the test to hold to take.
Course content (topics)	I. Home theoretical part (Lecture) Topic-1. The relevance of the use of EXM in energy. Basic concepts. Main tasks of the science. Available software. Loading and running DT . Topic-2. SCADA system and his/her capabilities . Familiarity with

programs used to depict electrical power supply circuits using a computer. Learning to draw 2D electrical power supply circuits in AutoCAD.

Topic-3. In energy applicable schemes types and describe them . Model concept. Electricity in supply issues solution stages. Algorithmization. Spreadsheet formulas department. Logical deeds.

Topic-4. CAD software supplies and from them use. Electricity supply system in design operators. Recursion operators

Topic 5. Representation of interchange and schematic diagrams using CAD software. MATLAB programming environment user interface. Solving linear problems in power supply. Matrix, special types of matrices.

Topic-6. Spreadsheet software supply and his/her possibilities. Electricity supply systems linear situation equations. Matrices add and subtraction and multiplication. Determinant.

Topic 7. Linear problems in energy and the use of "Spreadsheet" software in solving them. In modeling iterative operators. Matrices. Class .

Topic-8. Model in energy . Model. Types of models. Modeling in energy. Modeling stages.

Topic-9. In energy algorithmization. Algorithm. Algorithms types. Algorithms to describe methods. In energy algorithmization.

Topic 10. Using the C++ programming language to solve energy problems . Programming languages. C++ versions. VSC.

Topic 11. Dialogue mode used in energy programs. Existing dialog mode programs. Creating a dialog mode. The print() function.

Topic 12. Developing branching programs in the C++ programming language . Branching programs. If () conditional operator and from it use.

Topic 13. Using recursive operators in programming using the C++ programming language. for, while from operators use.

Topic 14. Complex programs and their preparation structures. Complex programs organization to grow stages.

Topic-15. MTV structure and his/her work mechanism. Models. Templates. Views. MTV structure. How MTV works

II. 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, 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.

All practical work and exercises are done on computers. Students will be able to from ECM in the power supply system during execution use and ECM issues at solution according to skills they produce

The following topics are recommended for practical training:

1. "Spreadsheet" software in the supply linear issues solution
2. "Spreadsheet" software in the supply branching issues solution.
3. "Spreadsheet" software in the supply recurring issues solution.
4. Energy issues in solution C++ programming language application.
5. C++ programming language through dialogue in mode programs organization to grow.

	6. C++ programming in the language linear programs preparation 7. C++ programming in the language branching programs preparation 8. Using recursive operators when writing programs using the C++ programming language. IV. Independent learning 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. Energy management of programs relevance 2. Electricity supply in the system applicable simulators 3. Modern electricity measurement tools and their application 4. Electricity in the system applicable programs to compose for user-friendly programming languages 5. Industry 4.0 to based simulators 6. Electricity efficiency calculator programs 7. Repeat recovering in sources applicable EXM types 8. SCADA in the system substation management implementation to grow 9. Energy working from issuing, his/her up to consumption was describe a systematic process diagram 10. CAD electrician software supply advantages 11. Electricity supply system principal schemes CAD software imaging 12. Electricity supply in the system applicable replacement schemes Depiction in CAD software 13. Exchange and Principal schemes CAD software supplies describe through 14. Spreadsheet software in supply information base preparation and install automatic filters on it. 15. "Spreadsheet" software supply and his/her opportunities. 16. "Spreadsheet" software supply functions. 17. In energy in modeling applicable software supplies and their advantages 18. In energy occurring in matters branching and using iterative algorithms. 19. C++ programming of the language energy issues in solution the importance of application . 20. In energy applicable dialogue in mode programs and their importance. 21. C++ programming in the language branching and recurring Using operators to solve energy problems. 22. OOP. To the object directed in energy applicable software and their preparation schemes. 23. In energy high level programs preparation structures MTV structure and his/her work mechanism. 24. "Request" send and "Response" acceptance to do structures of processes.
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,	10 points	

			practical, laboratory classes)		
	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. Steven W.Blume. Electric Power System Basics. USA.: Wiley–Interscience A John Wiley&Sous, INC Publication, 2014, 260 p. 2. Master SCADA, Gazieva R.T., Yadgarova D.B., Nigmatov A.M., Ozodov E.O. Tashkent 2020. 3. SCADA-system. Andreev Ye.B., Kutsevich N.A., Sinenko O.V. RTSOft- 2014. 4. AutoCAD 2020 Beginning and Intermediate. 5. AutoCAD 2019. A Power Guide for Beginners and Intermediate Users. CADArtifex, John Willis, Sandeep Dogra (2018) 6. A Python Book: Beginning Python, Advanced Python, and Python. 2013.Dave Kuhlman. 7. Larry Brackney Andrew Parker Daniel Macumber Kyle Benne Building Energy Modeling with OpenStudioA Practical Guide for Students. 8. Data Structure and Algorithmic Thinking with Python Data Structure and Algorithmic Puzzles by Narasimha Karumanchi. Additional literature: 9. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 10. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati‘yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017– 592 b 11. O‘zbekiston Respublikasining “Energiyadan ratsional foydalanish to‘g‘risida”gi Qonuni. 25-aprel 1997-yil. 12. O‘zbekiston Respublikasining “Elektr energetika to‘g‘risida”gi Qonuni. 30- sentabr 2009-yil. 13. Allaev K.R. Energetika mira i Uzbekistana. Analiticheskiy obzor. – T.: Moliya, 2007 – 388 str. 14. Rafikova G.R., Ro‘zinazarov M.R. “Energetikaning matematik masalalari” fanidan amaliy ishlarni bajarish uchun metodik qo‘llanma. T.; 2014 y. Internet sources: 16. www.ziyonet.uz – a search site for national educational materials. 17. www.gov.uz – Government portal of the Republic of Uzbekistan. 17. www.google.com – an international educational materials search site. 19. www.energystrategy.ru – information portal “Energy Policy and Strategy”. 20. www.twirpx.com – a search site for international educational materials.				

Name of subject	Mathematical problems of energy (ECTS 5)
Subject/module code	EMM2505
Science taught semester (s).	5 th semester
Responsible teacher	Jalilov Urinbay Abdunayim ugli, assistant.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hour - 150. Auditory training hours - 60. Lecture training hour - 30 Practical training hour - 30 Independent education -90 hour
ECTS	5
Science goals and objectives / learning outcomes	The goal of teaching science is s to develop students' skills in understanding the mathematical problems of energy, the implementation of digital energy technologies in the power supply system. At the same time, it is to comprehensively study smart grids and digital substations in the power system. The task of the subject is to comprehensively teach students about the mathematical issues of energy and its application in the power supply system, to develop skills in the use of digital devices in the process of automatic control and accounting of energy consumption in the power supply system, and to comprehensively teach all issues related to the basic concepts of digital energy, economic and technical calculations. Learning outcomes: 1. Learns to form a mathematical model (formulate equations and objective functions) for calculating and optimizing various states of electrical networks and systems, and to choose methods for solving mathematical problems in energy. 2. Will acquire skills in calculating and optimizing the states of simple electrical networks and systems in various ways. 3. Will acquire skills in calculating and optimizing the state of electrical networks and systems in various ways based on modern calculation tools and standard programs.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic-1. Introduction. The task of science. Topic-2. Formulation of the equations of state of electrical systems in matrix form. Matrix representations of Ohm's and Kirchhoff's laws. Topic-3. Determinants. Their properties. Algebraic complements and minor matrices. Topic-4. Properties of square matrices. Topic 5. Block matrices. complex matrices. Topic-6. Application of graph theory to solving equations of state of electrical systems. Topic 7. Writing a system of linear equations in matrix form. Topic-8. Methods for solving linear equations of state of electrical systems. Topic-9. Improved Gaussian method. Topic 10. Calculating a system of linear equations using the iteration method. Topic 11. Methods for solving nonlinear equations of steady states of electrical systems. Topic 12. Methods for optimizing the modes and parameters of electrical systems.

	II. Practical training instructions and recommendations. The teacher's preparation for a practical training session begins with the study of preliminary 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 training session, the amount of work that each student must perform. Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions. The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view. The following topics are recommended for practical training: ● Formulate the basic laws for the switching scheme. ● Express the basic electrical engineering laws for DC and AC electrical circuits in matrix form. ● Operations on complex matrices. ● Formulate the switching scheme of three-phase electrical networks. ● Formulate linear node equations in matrix form. ● Solve a system of linear node equations by exact methods. ● Methods for approximate solution of a system of linear node equations. ● Formulate nonlinear node equations describing the state of electrical networks in matrix form. ● Solve nonlinear node equations by iteration methods. ● Solve node equations by the Newton-Raphson method. ● Solve linear programming problems graphically and graphically. ● Apply methods for solving linear programming problems in optimizing power transmission lines. ● Solving linear programming problems using the simplex method. ● Determining the probabilities of arbitrary electrical quantities falling into a given interval. ● Strength indicators of electrical system elements. IV. Independent learning 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. Fundamentals of matrix theory. Characteristics of matrices. Determinants. Properties of determinants. 2. Operations on matrices. Inverse matrix. 3. Basic laws of electrical circuits. 4. Methods of calculating electrical circuits used in electrical engineering (nodal potentials, contour currents, superposition). 5. Construction of nonlinear node equations representing the state of electrical systems. 6. Energy characteristics of generators of power plants. 7. Mathematical methods of unconditional and conditional optimization.
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	10 points	

			activity (in seminars, practical, laboratory classes)		
	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. Электротехнический справочник: Т. 3. Производство, передача и распределение электрической энергии./Под общ. ред. профессоров МЭИ. – М.: Издательство МЭИ, 2004, 964 с. 2. Веников В.А.. Математические задачи энергетики.М.1987. 3. Гмурман Г.А.. Теория вероятностей и математическая статистика. М.: Статистика. 1988.-204с. 4. Фазылов Х.Ф. Т.Х.Насыров. Линейные расчетные модели сетей электрических систем. Тошкент: Фан. 1982.-96с. 5. Самарский А.А. Введение в численные методы. М.: Наука. 1987. 6. Коршунов Ю.М. Математические основы кибернетики. Учебн. пособие для ВУЗов. 3-е изд. Энергоатомиздат. 1987. 7. Сиддилов И.Х. и др. Математические задачи энергетики. Метод. указания. Ташкент, ТашГТУ, 1991., 2004. Additional literature: 8. Mirziyoyev Sh.M. Yangi O'zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 9. Mirziyoyev Sh.M. Milliy taraqqiyot yo'limizni qati'yat bilan davom ettirib yangi bosqichga ko'taramiz .–T.:“O'zbekiston”, 2017–592 b 10. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”. 11. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 12. Пармонов А.Э., Сиддилов И.Х. «Гидроэнергетиканинг математик масалалари» фанидан маъруза матни. ТошДТУ, 2002. Internet sources: 13. www.ziynet.uz – a search site for national educational materials. 14. www.gov.uz – Government portal of the Republic of Uzbekistan. 15. www.google.com – an international educational materials search site. 16. www.energystrategy.ru – information portal “Energy Policy and Strategy” 17. www.twirpx.com – a search site for international educational materials.				

Name of subject	Electrical Lighting (ECTS 5)
Subject/module code	EY2605
Science taught semester (s).	6 th semester
Responsible teacher	Narimonov Bahodir Absalomovich, senior teacher
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours - 150 Audience Training hours - 60 Lecture hours - 30 Practical hours - 30 Independent education - 90 hours
ECTS	5
The purpose and tasks of subject / learning outcomes	The purpose and task of teaching the subject The role of the electric power industry in the rapid development of the economy is incomparable. Due to the stable operation of the energy system of Uzbekistan, the national economy is provided with uninterrupted and high-quality electric energy. This process, in turn, increases the demand for training highly qualified personnel. This program reflects the goals and objectives, content of the subject "Electrical Lighting". The purpose of studying the subject is to familiarize students with the classification, structural structure of the energy industry, requirements for lighting equipment and methods for their implementation, as well as to form skills and qualifications in the effective operation of electric lighting devices in specific operating conditions
Course content (topics)	Main theoretical part (Lecture) Topic 1: Introduction. Basic laws of lighting technology. Consumers of radiant energy and their characteristics. Topic 2: Quantities characterizing the distribution of light. Topic 3: Light properties of objects. Topic 4: Physical measurements of light. Topic 5: Physical measurements and characteristics of light Topic 6: Incandescent and gas-discharge lamps. Topic 7: Connection diagrams of modern lamps in the form of incandescent and LED. Topic 8: Parameters and connection diagrams of fluorescent, LED and gas-discharge lamps. Topic 9: Requirements for lighting equipment. Topic 10: Requirements for lighting workshops and construction sites, as well as buildings. Topic 11: Design of lighting devices and calculation of lighting devices. Topic 12: Introduction to the operation of electric lighting devices. Topic 13: Specific features of modern energy-saving lighting devices II. Instructions and recommendations for practical train. The teacher's preparation for a practical training session begins with the study of 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 training session, the amount of work that each student must perform. Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

	The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view. Recommended practice topics 1. Measurement of the brightness of the immersion lamp and lamps. 2. Checking the equipment for adjusting the start-up of fluorescent LED lamps and their operation. 3. Scheme of switching on a fluorescent lamp with a pulse 4. Checking the anti-strobe effect when supplying a two-lamp circuit from one phase 7. Analysis of high-pressure mercury lamps and elements of lighting fixtures of modern energy-saving lighting devices. 8. Design of lighting fixtures and calculation of the illumination of lighting fixtures. 9. Calculation of the illumination of modern lighting fixtures. 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. Independent study for recommended topics. 1. Distribution of luminous flux by spectrum. 2. Special discharge lamps 3. Light-technical characteristics of lighting equipment 4. Selection of lighting equipment from an economic perspective. 5 Selection of lighting equipment supply scheme and network voltage 6. Operation of lighting electrical equipment. 7. Calculation of electrical lighting networks 8. Design of lighting devices and calculation of illumination of lighting devices. 9. Calculation of illumination of modern lighting devices
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. Kazuo Matsuda, Yasuki Kansha, Chihiro Fushimo, Atsushi				

Tsutsumi, Akira Kishimoto. Advanced Energy Saving and its Applications in Industry. Japan – “Springer”, 2013. – 94 p.

2. Xoshimov F.A.Taslimov A.D.Energiya tejamkorligi asoslari. O‘quv qo‘llanma. – T. “Voris”, 2014 – 192 bet.

3. Аллаев К. Р.Хошимов Ф.А.Энергосбережение в промышленных предприятиях, Монография. – Т.: Фан. 2012.

4. Блинов Ю.И.,Василев А.С.Никаноров др. Современные энергосберегающие электротехнологии. Учебное пособие. Издательство «ЛЕТИ», 2001. – 564 с.с.

5. Сибкин Д.М, Справочник по эксплуатации электроустановок промышленных предприятий: 5-э изд., испр. и доп.- М.: Высшая школа 2002

6. Справочник по наладке электрооборудования промышленных предприятий,Под ред. М.Г. Зименкова, Г.В. Розенберга, Е.М. Фескова. – 3-э изд., перераб. и доп. – М.: Энергоатомиздат, 2003.

7. Правила устройства электроустановок (ПУЭ) / Государственная инспекция “Узэнергонадзор”. Под общ. ред. Л.Д. Ниматуллаев, Б.Т. Ташпулатова, А.Н. Усманова /MChJ «Fan-Poligraf, 2011.

8. Elektr tarmoqlari va tizimlari: O‘quv qo‘llanma/ A.M. Safarov, T.Sh. G‘oyibov, A.X. Sulliyev. O‘zbekiston Respublikasi Oliy va o‘rta maxsus ta’lim vazirligi. Toshkent. Tafakkur bo‘stoni. 2013.-224 b.

9. Gayibov T.Sh. Elektr tarmoqlari va tizimlari. O‘quv qo‘llanma. – T.: «Voris-nashriyot». 2010.

10.T.Sh. Gayibov., B.M. Pulatov., A.E. Shanazarov. “Elektr tarmoqlari va tizimlari. Misol va masalalar to‘plami”. O‘quv qo‘llanma. –Toshkent., ToshDTU, 2021-175 b.

11.T.Sh. Gayibov, H.F. Shamsutdinov, B.M. Pulatov Elektr tarmoqlari va tizimlari fanidan kurs loyihasini bajarish uchun uslubiy qo‘llanma. – Toshkent: ToshDTU, 2015-57 b.

12.Electric Power Systems/ B.M.Weedy, B.J.Cory, N.Jenkins, J.B.Ekanayake, G.Strbac.- 5th ed., UK, A John Wiley and Sons, 2012.

13. Duncan Glover, Mulucutla s. Sarma, Thomas J. Overbye. Power System Analysis and Design/Fifth edition.- Australia, Brazil, Japan, United Kingdom, USA. CANGAGE Learning. 2010.

14. Arthur R. Bergen/ Power Systems Analysis / 2000.

15. Elektr tarmoqlari va sistemalari: uslubiy qo‘llanma/ O‘zR OO‘MTV; Rasulov A.N., Taslimov A.D., Mamarasulova F.S., Raxmonov I.U.– Toshkent: TDTU, 2014.- 90 b.

Main literature: Additional literature:

1. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b.

2. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati‘yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017– 592 b

11. O‘zbekiston Respublikasi Prezidentining 2022-yil 28-yanvardagi PF-60-son “2022-2026 yillarga mo‘ljallangan Yangi O‘zbekistonning taraqqiyot strategiyasi to‘g‘risida”gi Farmoni.

12. O‘zbekiston Respublikasi Prezidentining “Energiya tejoychi texnologiyalarni joriy qilish va kichik quvvatli qayta tiklanuvchi energiya manbalarini rivojlantirish bo‘yicha qo‘shimcha chora-tadbirlar to‘g‘risida”gi 09.09.2022 yildagi PF-220-son farmoni.

13. Лышкин А.В. Электрические системы и сети (Электронный ресурс): (учеб. пособ.)– Новосибирск: Изд-во НГТУ, 2002.-248 с

14. Электрические системы и сети. Буслова Н.В., Винославский В.Н., Данисенко Т.И., Перхач В.С. Под ред. Данисенко Г. – Киев: Высшая школа, 2006.

15. Блок В.М. Электрические сети и системы. Высшая школа, 2006.

Internet manbalar:

16. www.ziynet.uz – milliy o`quv materiallarini qidiruv sayti.

17. www.gov.uz – O`zbekiston Respublikasining hukumat portali.

17. www.google.com – xalqaro o`quv materiallarini qidiruv sayti.

19. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali

20. https://www.politesi.polimi.it/bitstream/10589/203854/3/Tesi_Roberta_Castellammare.pdf

21. www.twirpx.com – xalqaro o`quv materiallarini qidiruv sayti.

Name of subject	Transient processes and overvoltage (ECTS 5)
Subject/module code	O'KI2605
Science taught semester (s).	6 th semester
Responsible teacher	Khonturaev Ikromjon Munavarovich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-150. Audience Training hours - 60. Lecture training hour – 30 Laboratory training hour – 0 Practical training hour – 30 Independent education -90 hours
ECTS	5
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to ensure that students are able to construct equivalent circuit diagrams for analyzing and calculating the states of electrical system elements. They should develop an understanding of the electromagnetic and electromechanical transient processes occurring in the elements of electrical systems. In studying the states of electrical power system components, students must learn to formulate the basic equations used to analyze the effects of various factors on transient processes, and to master computational methods and techniques for solving these equations. Furthermore, the course aims to teach students about insulation problems related to the introduction of high voltage for long-distance electric power transmission. This includes the ionization and discharge processes occurring in the insulating parts of current-carrying components of the system, external (atmospheric) and internal overvoltages observed in the system, methods for limiting and protecting against these overvoltages, and the formulation and solution of the fundamental equations used to analyze wave, electromagnetic, and electromechanical processes occurring within the system using computational tools. The objective of the course is to enable students to construct equivalent circuit diagrams of power network elements and determine their parameters, as well as to develop an understanding of the electromagnetic and electromechanical transient processes occurring in elements of electrical systems. In studying the behavior of electrical power system components, students are expected to analyze the influence of various factors on transient processes, and understand the ionization and discharge phenomena occurring in the dielectric materials insulating current-carrying components, in order to ensure the normal operating mode of the power system. The course also covers the impact of electric field strength and electrode geometry on the flashover and breakdown voltages of insulation, as well as the occurrence of internal and atmospheric overvoltages in the system. Students will learn methods for protecting against and limiting these overvoltages and will be taught how to formulate the fundamental equations for analyzing these phenomena. Additionally, they will master the application of computational techniques and numerical methods for solving such equations as a basis for comparative evaluation and system protection design. Learning Outcomes: 1. To become familiar with the role of electrical energy in society and its socio-economic significance. 2. To gain an understanding of overvoltages and the insulating materials used in insulation systems, including the selection and application of electrical equipment designed to withstand

	overvoltages, protection against overvoltages, types and causes of short circuits, measures for protection against short circuits, switching devices, and the analysis of static and dynamic stability in electrical systems. 3. To develop the ability to select and apply insulating materials used in overvoltage protection, analyze overvoltage phenomena, identify types and causes of short circuits, apply protection methods against short circuits, evaluate switching devices, and analyze static and dynamic stability in electrical systems. 4. To acquire practical skills in the operation of basic electrical equipment used in overvoltage protection and insulation, such as lightning arresters, surge arresters, and protective ground wires. 5. To develop proficiency in the selection criteria and calculation methods for basic electrical equipment used in overvoltage protection and insulation systems.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topics: 1. Types of Transient Processes and Basic Concepts of the Subject 2. Equivalent Circuits of Power System Elements, System Conditions and Parameters, and Their Interrelations 3. Per-Unit System 4. Static Stability Margin Coefficient of a Simple Power System and Methods of Its Improvement 5. Effect of Voltage Drop at System Nodes on Maximum Power Transfer 6. Main Assumptions in Dynamic Stability Analysis. Equivalent Circuit and Power Characteristics in Normal, Fault, and Post-Fault Conditions 7. Effect of Automatic Voltage Regulators (AVR) and Automatic Frequency Controllers (AFC) on Power System Dynamic Stability 8. Basic Concepts in High Voltage Engineering. Electric Field and Its Parameters 9. Dielectric Strength of Solid, Liquid, and Composite Insulation 10. Electrical Characteristics of Suspension, Post, and Bushing Insulators 11. Insulation of Overhead Power Transmission Lines. Voltage Distribution Along Insulator Strings 12. Atmospheric Overvoltages in Power Systems 13. Lightning Arresters Used in Power Systems 14. Grounding of High Voltage Electrical Installations. Protection Devices and Equipment Against Overvoltage 15. Switching Overvoltages and Resonance Overvoltages in Power Systems II. Instructions and recommendations for organizing laboratory exercises. Laboratory work is not included in the curriculum III. Practical training instructions and recommendations The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Methodological guidelines serve as the primary instructional document for instructors in preparing and conducting practical sessions. The purpose of the practical session is to facilitate the comprehension of theoretical material, the acquisition of practical skills, the ability to

consciously apply knowledge in academic and professional activities, and the development of critical thinking and confidence in forming personal viewpoints.

Recommended Practical Topics:

1. Determining parameters of elements and developing equivalent circuits for short-circuit calculations
2. Calculating symmetrical and asymmetrical short-circuit conditions using various methods
3. Calculating and analyzing the static stability of an electric power system
4. Analyzing the dynamic stability of an electric power system
5. Characteristics of the electric field
6. Electrical insulation materials
7. Power supply and distribution equipment
8. Solving problems related to breakdown, flashover, and discharge voltages in dielectrics
9. Protection of system elements against direct lightning strikes
10. Solving problems related to the selection of lightning arresters and grounding resistance
11. Selection of surge arresters
12. Solving problems related to atmospheric and internal overvoltages and the use of surge arresters for protection
13. Solving problems related to the lightning resistance of overhead transmission lines
14. Examination of visible corona discharge on conductors of overhead transmission lines
15. Study of voltage distribution along suspension insulator strings

IV. Independent learning and independent work.

Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form.

Recommended topics for independent study:

1. Equations of system elements in the d,q coordinate system
2. Checking the electromagnetic instability of a simple electrical system by solving the characteristic equation
3. Analyzing the electromechanical instability (self-oscillation) mode of an electrical system
4. Asynchronous mode of the system and methods for its elimination
5. Resynchronization mode for generators that have lost synchronization
6. Checking the stability of synchronous and asynchronous motors during sudden voltage changes in the system
7. Checking the stability of synchronous and asynchronous motors during sudden voltage changes in the system (duplicate topic)
8. Checking the dynamic stability of a complex electrical system
9. Requirements used to improve the static stability of the system
10. Electric field: field intensity and its dependence on the shape of electrodes
11. Discharge time and the volt-second characteristic of the air insulation gap
12. Testing the transient processes and insulation of high-voltage electrical machine windings
13. Partial discharges in insulation and methods for their detection
14. New types (models) of lightning arresters and surge arresters used in overhead power transmission lines, and their technical characteristics

	15. The geographic-topographic dependence of thunderstorm days and the causes of lightning occurrence 16. Pollution zones and their relation to the number of insulators 17. Determining the number and height of lightning arresters used to protect electrical equipment at substations and switching stations 18. Impulse withstand voltages of electrical devices
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: - Аллаев К.Р. Электромеханические переходные процессы: Т.ТГТУ, 2008 - Allayev K.R. Elektromexanik o'tkinchi jarayonlar. Toshkent ToshDTU, 2007-227b - Овчинников В.В. Расчёт и анализ устойчивости электрических систем. Учебно методическое пособие по курсовому проектированию. Киров, Изд. ВятГУ, 2007-74с - U.B.Sharipov, X.A. Shamsiyev. "O'tish jarayonlari-1 qism" fanidan ma'ruzalar matni .TDTU, 2001y-90b - S.J.Xaydarov, U.B.Sharipov. "O'tish jarayonlari-2 qism" fanidan ma'ruzalar matni .TDTU, 2001y-95b - Крючков И.П., Старшинов В.А., Гусев М.В., Пираторов М.В. Переходные процессы в электрических системах /под.ред И.П.Крючкова/ учебник для ВУЗов М.: издательский дом МЭИ, 2008.-416с. - Куликов Ю.А. Переходные процессы в электрических системах: учебное пособие. Новосибирск: НГТУ, М.: Мир: ООО «Издательство АСТ», 2003-283 с - Переходные процессы электрических систем в примерах и иллюстрациях. Учебное пособие для вузов.//Под.редакцией В.А.Строева, М.: ЗНАК, 1996-224с - Переходные процессы: Конспект лекции. Махмутов Т.Ф., Хабибулина А.Т.-Ташкент: ТГТУ, 2014-90с - Макаров У.Ф. Справочник по электрическим сетям 0,4-35кВ и 110-1150/ под ред. И.Т.Горюнина, А.А.Любимова. М.: Папирус				

ПРО 2003-954с

11. Xamidov Nigmatulla. Yuqori kuchlanish texnikasi va izolyasiya. T.: “Fan va texnologiya”, 2012 -200b
12. Александров Г.Н. Ограничение перенапряжение в электрических сетях. Учебное пособие. Издание Центра подготовки кадров. 2003-214с
13. Кобзистый С.Ю. Техника высоких напряжений: Изоляция и перенапряжение в электрических сетях. Воронеж. Международный институт компьютерных технологии. 2007-104с
14. Басманов В. Г. Изоляция и перенапряжение. Учебное пособие. Киров, Вят ГУ, 2005-152с
15. Хайдаров С.Д. Методические указание к практическим занятиям по курсу «Перенапряжение и изоляция». Ташкент ТашГТУ, 2008-157с
16. Xaydarov S.D., Omonova X.U. “O’ta kuchlanish va izolyasiya” fanidan laboratoriya ishlarini bajarish uchun o’quv uslubiy ko’rsatma. Toshkent ToshDTU, 2014-99s
17. Курганов В.В. Изоляция и перенапряжение в электроэнергетических системах. Курс лекции одноименной дисциплине для студентов “электроэнергшетика” Гомель. ГГТУ им. П.О.Сухого, 2010-93с
18. Лифанов В.Н. Электроизоляция и перенапряжение. Учебное пособие. Владивосток: ДВГТУ, 2003-128с

Additional literature:

19. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b.
20. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati’yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b
21. O‘zbekiston Respublikasi Prezidentining 2022-yil 28-yanvardagi PF-60-son “2022-2026 yillarga mo‘ljallangan Yangi O‘zbekistonning taraqqiyot strategiyasi to‘g‘risida”gi Farmoni.
22. O‘zbekiston Respublikasi Prezidentining “Energiya tejovchi texnologiyalarni joriy qilish va kichik quvvatli qayta tiklanuvchi energiya manbalarini rivojlantirish bo‘yicha qo‘shimcha chora-tadbirlar to‘g‘risida”gi 09.09.2022 yildagi PF-220-son farmoni.
- 23.Курганов В.В. Изоляция и перенапряжение в электроэнергетицеских системах. Курс лекции одноим. Дисциплине для студентов специальностей 1-43 01 02 Гомель. ГГТУ им. П.О.Сухого, 2010-93с
24. Лифанов В.Н. Электроизоляция и перенапряжения. Учебное пособие. Владивосток: ДВГТУ, 2003-128с
25. Электромагнитные переходные процессы в электроэнергетических системах (электронный ресурс): метод.указания по практическим занятием /состав. А.Э.Бобров, А.М.Дяков, В.Б.Зорин, Л.И.Пилющенко. Электр Дан (Мб).- Красноярск: ИПК СФУ, 2009-92с
26. Пивняк Г.Г., Винасловский В.Н.и др. Переходные процессы в системах электроснабжения. Учебник для вузов 3-изд, переработанные и дополненные. М.: Энергоатомиздат, Днепропетровск. Национальный Горный институт. 2003-584с
27. Правила технической эксплуатации электрических станции и сетей. М.: Издательства НЦ ЭНАС. 2003-454с

Internet resources:

	28. www.ziyonet.uz – milliy o‘quv materiallarini qidiruv sayti. 29. www.gov.uz – O‘zbekiston Respublikasining hukumat portali. 30. www.google.com – xalqaro o‘quv materiallarini qidiruv sayti. 31. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali 32. www.twirpx.com – xalqaro o‘quv materiallarini qidiruv sayti.

Subject name	Qualification internship (ECTS 34)											
Subject/module code	MA26834											
Semester(s) in which the subject is taught.	6 th and 8 th semesters											
Responsible teacher	Parsokhonov Abdulkobi Gafurovich, (PhD), associate professor; Nurullaev Orzikul Ubayevich, Senior teacher; Majidov Xomidxon Orifxon ugli, Assistant, Suyarov Anvar Olimjon ugli, Assistant; Boliev Alisher Mardievich, Assistant; Jumanov Abbos Nabijonovich, Assistant; Tulakov Jakhongir Turaqul ugli, Assistant; Sorimsokov Uchkun Soatboy ugli, Assistant; Yuldoshova Mukhayyo Olimjon kizi, Assistant.											
Education language	Uzbek											
Connection to the curriculum	Compulsory											
Training hours (this including independent education)	<table><tr><td colspan="3">Total hours-1020</td></tr><tr><td>Semester</td><td>6</td><td>8</td></tr><tr><td>Total workload</td><td>120</td><td>900</td></tr></table>			Total hours-1020			Semester	6	8	Total workload	120	900
Total hours-1020												
Semester	6	8										
Total workload	120	900										
ECTS	34											
Prerequisites/relationship with subjects	Introduction to the Specialty, Thermal engineering and hydropower, Theoretical Electrical Engineering, Electric drive, Electric machines, Electrical and Electronic Devices, Special electric machines, Automated electric drive, Mathematical Modeling and Design of Electric Machines, physics, Automatic Control Theory, Operation of electrical machines and transformers, Power supply, Electrical networks and systems, Power management and optimization. Relay protection, Mathematical problems of energy, Alternative energy sources in the power supply system.											
Objective of the subject/learning outcomes	The purpose of the Qualification internship is to help 3 rd and 4 th year students of the educational programs Power Engineering and Electrical Engineering consolidate the theoretical knowledge gained in compulsory and elective subjects during the academic year, as well as learn how to choose a topic for their graduation thesis, study the problems of the enterprise, and provide practical assistance in solving the problems of a production enterprise in the next academic year through coursework and course projects, and graduation thesis.											
Qualifying practice (topics)	I. Main practical part. Topic 1. Familiarization with the history and internal regulations of the production enterprise, as well as technical safety instructions. Topic 2. Efficiency of the enterprise's production electrical machines and electrical devices. Topic 3. Getting to know the production departments of the enterprise. Topic 4. Familiarization with the production capacity of the enterprise and the contribution of manufactured products to the development of the Republic. Topic 5. Studying the impact of a company on the environment Topic 6. Collect complete information about energy-efficient electric machines and processes to be introduced into production.											

	Topic 7. Collect information about the economic efficiency of the enterprise. Topic 8. Collect information about the technologically advanced energy-efficient electric machines and electric vehicles and power supply and energy auditor. Topic 9. Determining the performance of transformers, electrical networks, electrical machines, PLC, SCADA, and energy efficiency indicators. Topic 10. Information on and extracts from State regulatory documents used in production. Topic 11. Methods for studying the physical, mechanical properties and chemical composition of raw materials used in production and finished products, and obtaining information about energy-efficient electrical machines and power supply. II. Instructions and recommendations for organizing training for professional practice. - The enterprise introduces students to the rules of internal order and technical safety; - Students must fully comply with the internal order of the enterprise during the period of professional production practice; - Students collect information about the enterprise during professional production practice and study the problems of the enterprise; - The student can work as an assistant in any of the workshops of the enterprise; - After the establishment of workplace safety and general instructions, students are allowed to independently familiarize themselves with the rules of the workplace; III. Recommended topics for professional practice work: 1. Introduction. 2. History of the enterprise. 3. Energy efficiency of the enterprise's production electric machines. 4. Get acquainted with the general plan of the enterprise and the plans of its departments. 5. Get acquainted with the production capacity of the enterprise and the contribution of manufactured products to the development of the Republic. 6. Study the impact of the enterprise on the environment and ecology. 7. Collect complete information about the raw materials brought into production. 8. Collect information about the economic efficiency of the enterprise (for the economic part). 9. Collect information about the introduced technological energy-saving electric machines and electrical processes. 10. Determining the performance of transformers, electrical networks, electrical machines, PLC, SCADA, and energy efficiency indicators. 11. Obtain information about the production and auxiliary electrical processes of the enterprise.

Exam format	1. Correctly perform the tasks specified in the internship program. 2. Obey the internal labor regime and procedures of the production enterprises where the internship is conducted. 3. Study and strictly adhere to the rules of labor protection, technical safety and industrial sanitation. 4. Participate in the internship in accordance with the instructions given by the department. 5. Keep a diary, keep it in accordance with the rules for the implementation of the assigned tasks. 6. Prepare a written report on the completed tasks to the internship supervisor and submit a test (report defense) on the internship.
Learning outcomes and exam requirements	In the qualification (working) practice, students are required to fully master practical concepts, correctly organize the results of the analysis, independently think about the processes and phenomena being studied, and complete tasks in the form of evaluating the practice, as well as tasks for the final assessment.. The student must complete the final qualification internship within the specified time frame, completing independent theoretical and practical assignments according to the relevant qualification production internship program. A student who has not completed the qualification practice tasks, as well as who has scored 60 points on these tasks and the type of control, is included in the final control type, and if the score is below 59.9 points, he is considered to have failed the final control. A student who has not passed the final exam or has not scored 60 points on this type of exam is considered to have failed the final control.
Recommended readings	Main literature: 1. Elektr tarmoqlari va tizimlari: O'quv qo'llanma/ A.M.Safarov, T.Sh. G'oyibov, A.X. Sulliyev. O'zbekiston Respublakasi Oliy va o'rta maxsus ta'lim vazirligi. Toshkent. Tafakkur bo'stoni. 2013.-224 b. 2. N.B.Pirmatov, O.E.Zayniyeva, N.A.Qurbonov, B.S.Bobonazarov. Elektr mashinalari. O'quv qo'llanma – T.: «Voriz - nashriyot», 2020, 237 b. 3. Gayibov T.Sh. Elektr tarmoqlari va tizimlari. O'quv qo'llanma. – T.: «Voriz-nashriyot». 2010. 3. Alimxodjayev K.T., Pirmatov N.B., Ziyoxodjayev T.I. Elektr mashinalari. - T.: 4. Berdiyev U.T., Pirmatov N.B. Elektromexanika. - T., Shams-Asa. 2014. -392 b 5. Majidov S. Elektr mashinalari va elektr yuritma. - T.: O'qituvchi, 2002. -358 b. “Fan va texnologiya”, 2018. -344 6. Korxonaning pasporti. 7. Korxonaning Nizomlari. 8. Texnologik jarayonlarda ishlatiladigan uskunalarning texnik pasporti. 9. O'zbekiston Respublikasi Prezidentining 2017-yil 27-iyuldagi “Oliy ma'lumotli mutaxassislar tayyorlash sifatini oshirishda iqtisodiyot sohalari va tarmoqlarining ishtirokini yanada kengaytirish chora-tadbirlar to'g'risida”gi PQ-3151-sonli Qarori, O'zbekiston Respublikasi Oliy va o'rta maxsus ta'lim vazirligining 2017-yil 1-avgustdagi 527-sonli buyrug'i hamda

	vazirlikning 2022-yil 13-iyundagi “Oliy ta’lim muassasalari talabalarining malaka amaliyotini o’tash tartibini takomillashtirish to’g’risida”gi 202-sonli buyrug’i bilan tasdiqlangan Nizom talablari. 10.Korxona tomonidan ishlab chiqarishda foydalaniladigan Davlat meyoriy hujjatlari (GOST lar). Internet resources: 11.www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. 12.www.ziyonet.uz – National educational materials search site. 13.www.gov.uz – Government portal of the Republic of Uzbekistan. 14.www.google.com – International educational materials search site. 15.www.energystrategy.ru–“Energy Policy and Strategy” information portal 16.www.twirpx.com – international educational materials search site.