

Name of subject	Energy saving in heat energy (ECTS 10)
Subject/module code	IEET1110
Science taught semester (s).	1 st and 2 nd semesters
Responsible teacher	Nazarov Furkat Daminovich (PhD), Senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-300 1st semester Contact hours – 44 Lecture training hour – 22 Practical training hour – 22 Independent education -106 hours 2nd semester Contact hours - 46 Lecture training hour – 24 Practical training hour – 22 Independent education -104 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	<p>The purpose of teaching the subject is to “Energy saving in heat energy” is to teach the formation of skills to determine the types of secondary energy sources in industrial enterprises, their potential, types of use of the heat of gases coming out of heat technology devices, energy and exergy indicators of heat use, types of energy-technological aggregates and their efficiency.</p> <p>The task of the subject is to are the types and reserves of secondary energy sources generated in energy, energy-technological devices and technologies in industrial enterprises, analysis of the characteristics and potentials of the exit gases of heat technology devices, drawing up the energy and exergy balance of heat technology devices, methods of calculating efficiency, waste consists in mastering the principles of heat utilization.</p> <p>Learning outcomes:</p> <ol style="list-style-type: none"> 1. Having an idea about the systematic analysis in solving organizational and technical issues in the management of the energy industry of objects. 2. The importance of how to form an energy passport. 3. Develop energy efficient design proposals that meet energy efficiency requirements. 4. To know and be able to use the methods of evaluating the good or bad, social, economic, ecological and technical consequences of the decisions being made. 5. The main performance indicators and options for their improvement in different types of energy devices. 6. Increasing the efficiency of energy equipment. 7. Economic assessment of service quality and its competitiveness by types of energy devices. 8. To know and be able to use the existing main legal and regulatory documents in the field
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. Types and potentials of secondary energy sources Topic 2: Types of disposal of heat of gases emitted from technological devices. Topic 3: The use of outgoing heat for internal regenerative, external

technological and energy purposes.

Topic 4: Classification of boilers-utilizers, that is, boilers that re-use the heat of exhaust gases

Topic 5: Decontamination of slurries of metallurgical production by fire

Topic 6: Gas turbine boiler-utilizers.

Topic 7: Water-pipe boiler-utilizers. Structural elements of water-pipe boiler-utilizers

Topic 8: Boiler-utilizers of sulfur-torch burning furnaces

Topic 9: Dry cox quenching device.

Topic 10: Boiler-utilizers of steel melting and rolling production.

Topic 11: Electrotechnological combination in pulp and paper production.

Topic 12: Electrotechnological combination in blast furnace and hydrogen production.

Topic 13: Cooling of structural elements of high-temperature devices.

Topic 14: Disposal of used steam.

Topic 15: Disposal of low-potential heat waste

Topic 16: Disposal of low-potential flue gases.

Topic 17: Steam-gas devices.

Topic 18: Steam-gas plant with steam injection.

Topic 19: Energy efficiency in industry.

Topic 20: Heat supply from compressor devices disposal devices.

Topic 21: Energy saving in the gas industry (compressor industry).

Topic 22: Types of losses in the boiler room and their calculation method.

Topic 23: Energy saving in heat supply 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:

1. Calculation of the total heat content of waste gases.
2. Determination of fuel savings when using waste gas heat.
3. Calculation of the combustion process in use of exhaust gases containing combustible gases
4. Energy saving when low-temperature heat carrier is disposed.
5. Energy saving in the use of a steam-gas device.
6. Calculation of energy saving potentials in hot water, steam production and distribution systems.
7. Assessment of energy consumption by gas heating devices.
8. Energy saving in the use of heat pumps.
9. Calculation of technical and economic efficiency of energy-saving measures.

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

	<p>mobile devices under the guidance of a teacher in a traditional or electronic form.</p> <p>Recommended topics for independent study:</p> <ol style="list-style-type: none"> 1. Energy saving reserves and energy saving measures in various industries. 2. World experience of using new energy-efficient technologies in industry. 3. Thermal power plants. Thermal power centers.. 4. Determination and adjustment of efficiency of heat exchange devices used in industry. 5. The method of transferring the mode switch of the boiler device (making a mode card). 6. Compilation of exergy balances of heat-consuming devices. 7. Thermal schemes and efficiency of modern steam and gas plants. 8. Application of new energy-efficient technologies in industrial heat supply systems. 9. Disposal of the heat of combustion products. 10. Disposal of low-potential flue gases. 11. Heat supply from compressor devices disposal devices. 12. Energy efficiency in the gas industry (compressor industry). 13. Calculation of the total heat content of waste gases 14. Determination of fuel savings when using waste gas heat 15. Energy saving in steam and hot water supply systems 16. Electrotechnological combination in blast furnace and hydrogen production 17. Disposal of the heat of combustion products 18. Disposal of low-potential flue gases 19. Heat supply from compressor devices disposal devices 20. Energy efficiency in the gas industry (compressor industry). 21. Energy saving in boiler rooms 22. Energy saving in heat supply systems 23. Reduction of heat loss through the use of double-chamber window-frames in the construction of buildings 24. Infrared heating system of industrial facilities 25. Moist air and moist combustion products 26. Steam-gas plant with steam injection 27. Calculation of energy saving potentials in hot water and steam production and distribution systems 28. Assessment of energy consumption by gas heating devices 29. Energy saving in the use of heat pumps 30. Calculation of technical and economic efficiency of energy-saving measures 31. Calculation of technical and economic efficiency of energy-saving measures 32. Energy saving in heat supply systems
Exam form	Written
Teaching/learning and examination requirements	<p>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.</p> <p>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.</p> <p>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.</p>

	<p>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.</p> <p>The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers.</p> <p>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.</p>
Scope of assessment criteria and procedure	<p>CURRENT CONTROL</p> <p>Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics.</p> <p>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.</p> <p>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.</p> <p>MIDTERM CONTROL</p> <p>Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.</p> <p>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.</p> <p>INDEPENDENT LEARNING</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>FINAL CONTROL</p> <p>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.</p>

	<p>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.</p> <p>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.</p>				
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)	

	<table><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>	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	<p>Main literature:</p> <ol style="list-style-type: none">1. Solar Engineering of Thermal Processes, Photovoltaics and Wind. John A. Duffie, William A. Beckman, Nathan Blair, 2020.2. Renewable Energy Sources: Engineering, Technology, Innovation: ICORES 2017 (Springer Proceedings in Energy)3. Advances in Solar Photovoltaic Energy Systems (2024). Almoataz Y. Abdelaziz, Mahmoud A. Mossa, Najib El Ouanjli.4. Physics of Solar Energy and Energy Storage. C. Julian Chen, 2024.5. The Solar Generation: Childhood and Adolescence of Terrestrial Photovoltaics. Philip R. Wolfe, 2018. <p>Additional literature:</p> <ol style="list-style-type: none">6. Saitov E.B., Yuldoshev I.A. Quyosh panellarini oʻrnatish, sozlash va ishlatish// Oʻquv qoʻllanma. Toshkent. “Noshir” nashriyoti, 2017.7. Mamajanov T.B., Nurmanov S.R. Qayta tiklanuvchan energiya manbalari. TAQI. Toshkent-2016. <p>Internet resources:</p> <ol style="list-style-type: none">1.www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.2. www.ziynet.uz – national educational materials search site.3. www.gov.uz – Government portal of the Republic of Uzbekistan.4. www.google.com – international educational materials search site.5.www.energystrategy.ru – “Energy Policy and Strategy” information portal6. www.twirpx.com – international educational materials search site.										