

<b>Name of subject</b>	<b>Production processes of alternative fuels (ECTS 6)</b>
<b>Subject/module code</b>	MYICHJ1106
Science taught semester (s).	1 <sup>st</sup> semester
Responsible teacher	Abdullaev Elnur Akhmatovich (PhD), associate professor.
Education language	English
Connection to the curriculum	Compulsory
Training hours (this including independent education)	<b>Total hours-180.</b> <b>Contact hours - 54.</b> Lecture training hour – 28 Practical training hour – 26 <b>Independent education -126 hours</b>
ECTS	6
The purpose and tasks of subject / learning outcomes	<p>The purpose of teaching subject is to teach students about the processes of production of alternative fuels, the structure and principle of operation of devices used in the production, transmission and distribution of alternative energy, to process the results of experiments based on theoretical knowledge, and to verify theoretical knowledge in practice. is the formation of knowledge, skills and competences.</p> <p>The task of subject is to analyze the history of the development of alternative energy sources, evaluation methods, the state of the potential of alternative energy sources in the country, the typical design of alternative energy sources and their application characteristics, the use of wind and solar energy, and the analysis of the laws of obtaining alternative fuels. to have general concepts and skills in teaching methodology.</p> <p><b>Learning outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Acquaintance with the basics of production processes of alternative fuels based on modern types, methods and programs</li> <li>2. Role of alternative fuel production processes in society and socio-economic importance</li> <li>3. Acquaintance with production processes of alternative fuels</li> <li>4. Studying the processes of production of alternative fuels using modern computer programs</li> <li>5. To study technical and economic indicators of production processes of alternative fuels, their place in ecology and the principles of use</li> <li>6. Increasing the efficiency of equipment for the production of alternative fuels</li> <li>7. Economic assessment of the competitiveness of methods of production processes of alternative fuels</li> <li>8. To know and be able to use the existing main legal and regulatory documents in the field</li> </ol>
Course content (topics)	<p><b>I. Main Theoretical Part (Lecture Sessions)</b></p> <p><b>Topic 1:</b> Introduction to subject. Types of alternative fuels and their preparation technologies. Main concepts and dimensions</p> <p><b>Topic 2:</b> Prospects of using alternative fuels as motor fuel</p> <p><b>Topic 3:</b> Use of biomass for energy purposes. Types of alternative fuel resources</p> <p><b>Topic 4:</b> The future of Uzbekistan's energy industry</p> <p><b>Topic 5:</b> Human internal energy and caloric content of food</p> <p><b>Topic 6:</b> Problems of energy production and consumption</p> <p><b>Topic 7:</b> Liquid and gas</p> <p><b>Topic 8:</b> Catalysts</p>

**Topic 9:** Synthesis gas. Hydrogenation of fats

**Topic 10:** The theory of obtaining fuel from petroleum raw materials

**Topic 11:** Possibilities of increasing fuel efficiency in thermal power plants

**Topic 12:** Combustion temperature of fuel

**Topic 13:** Solid fuel properly flowing burner equipment

**Topic 14:** To determine the difference between the lower and upper combustion heat of fuel

## **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. Analysis of indicators of use of alternative fuel resources in Uzbekistan
2. Environmental problems of energy in the world and in Uzbekistan
3. Problems of energy accumulation
4. Biomass is like a renewable energy source
5. Biofuels as an alternative fuel
6. Human biological power, caloric value of food
7. Problems of fuel production and consumption
8. Problems of moving energy and energy carriers
9. Obtaining energy through nuclear fission
10. Methods of obtaining energy through fusion
11. New solutions in the field of creating combined solid fuels

## **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. Alternative energy and its development trends in the world
2. Traditional and non-traditional energy sources and types of fuel based on them
3. Dynamics of consumption of energy resources and reserves
4. The main objects of non-traditional energy of Uzbekistan
5. Types of alternative fuel resources
6. Use of biofuel for energy purposes
7. Use of biomass for energy purposes
8. Biodiesel fuels
9. Thermochemical processes
10. Alcohol and methods of obtaining it. Alcoholic fermentation
11. Use of ethanol as fuel
12. Environmental problems in the use of traditional and non-traditional energy sources
13. Compressed natural gas. Compressed petroleum gas
14. Gas condensate
15. Hydrogen fuel

	<p>16. Metal as an alternative fuel</p> <p>17. Methods of obtaining high-octane gasoline. Aromatic hydrocarbons, alkylbenzene, synthetic ethers</p> <p>18. Strategy of rational use of natural gas</p>
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. 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><b>CURRENT CONTROL</b></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><b>MIDTERM CONTROL</b></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><b>INDEPENDENT LEARNING</b></p> <p>Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and</p>

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	<p><b>Main literature:</b></p> <ol style="list-style-type: none"> <li>1. Law of the Republic of Uzbekistan "On the use of renewable energy sources" No. ORQ-539, adopted on May 21, 2019.</li> <li>2. Biogas energy system for renewables: market status and technology outlook. IRENA 2015.</li> <li>3. Uzoqov G'.N. Muqobil energiya manbalari. O'quv qo'llanma. Toshkent.Voris. 2017 yil.</li> <li>4. The Solar Generation: Childhood and Adolescence of Terrestrial Photovoltaics. Philip R. Wolfe, 2018.</li> <li>5. Solar Engineering of Thermal Processes, Photovoltaics and Wind. John A. Duffie, William A. Beckman, Nathan Blair, 2020.</li> </ol> <p><b>Additional literature:</b></p> <ol style="list-style-type: none"> <li>1. Mirziyoyev Sh.M. Yangi O'zbekistonda erkin va farovon yashaylik. –T.: "TASVIR nashriyot uyi", – 2021.– 50 b.</li> <li>2. Mirziyoyev Sh.M. Milliy taraqqiyot yo'limizni qati'yat bilan davom ettirib yangi bosqichga ko'taramiz. –T.: "O'zbekiston", 2017– 592 b</li> <li>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".</li> <li>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".</li> </ol> <p><b>Internet resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="http://www.lex.uz">www.lex.uz</a> – National database of information on legal documents of the Republic of Uzbekistan.</li> <li>2. <a href="http://www.ziynet.uz">www.ziynet.uz</a> – national educational materials search site.</li> <li><a href="http://www.google.com">www.google.com</a> – international educational materials search site.</li> </ol>				

	<p>3.<a href="http://www.energystrategy.ru">www.energystrategy.ru</a> – “Energy Policy and Strategy” information portal</p> <p>4.<a href="http://www.twirpx.com">www.twirpx.com</a> – international educational materials search site.</p>
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