REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION

KARSHI ENGINEERING ECONOMICS INSTITUTE

HEAT TECHNIQUE
of science

SCIENCE PROGRAM

Field of knowledge: 720 000 – Production - technical field

Field of study: 710 000 – Engineering

Areas of education: 60730300 – Construction of buildings and structures (objects of the oil and gas processing industry)

Karshi 2022

Science (module) code	Academic year	Semester	ECTS credit
ISTEX1115	2022-2023	3	4

Science (module) type	Language of education	Weekly lesson time
Compulsory subjects	English	4

1	The name of the subject	Audience training (hour)	Independent education	Total download
	Heat technique	60	60	120

2. The content of science

2.1 The purpose and tasks of teaching science

The purpose of teaching science: The purpose of teaching science is to guide every student studying in these areas in the types, structure, cycles of heat engines in the field of thermal energy, as well as the thermodynamic processes and heat transfer that occur in them. is the formation of knowledge, skills and qualifications suitable for the profile.

The task of science is to teach students the theoretical and practical laws of hydraulics and to teach them specific engineering problems and the processes of heat and electricity generation.

2.2 The main theoretical part (lecture sessions).

Science content topics:

Module 1. Enter

Topic 1: Introduction to the science of " Heat technology " .

History and development trends of heat engineering. Results of socio-economic reforms in our republic in non-energy fields and territorial problems and achievements of science, technology and technology. Tasks of science. Thermodynamic system and working body. A social thermodynamic state parameters. Thermodynamic surface. Basic gas laws. Ideal gas equation of state . Gas constant.

Module 2. Thermodynamics

Topic 2: Heat capacity. Molecular-kinetic theory of heat capacity of gases. Actual and average heat capacities. Empirical expressions of gas heat capacities. Dependence of heat capacity on process and temperature.

Topic 3: Mixtures of ideal gases. Dalton's law. Methods of administration of the composition of the mixture. The composition of mixture pointers and its representation through component pointers.

Topic 4: Law of conservation and circulation of energy. Amount of work and heat in a thermodynamic process. of thermodynamics Law I. of thermodynamics Definition of I-law. Expression of the I-law through internal energy. Absorption (expansion) work. Enthalpy. of thermodynamics Representation of the I-law by ni ent al pia .

Topic 5: Analysis of the main thermodynamic processes. Analysis of isobaric, zochoric and isothermal, adiabatic and polytropic processes .

Topic 6: Definitions of the second law of thermodynamics . Right and inverse periodicity. Thermal FIK of the heating device. Cooling coefficient Carnot cycle and theorem. Carnot's correct, reversible cycles.FIK Analytical view of the II law of thermodynamics for reversible processes and cycles.

Module 3. Water vapor and its properties

Topic 7: Water vapor. Evaporation and condensation. Dependence of saturated vapor pressure on temperature. Equilibrium state in phase transition. Evaporation and turning steam back into water. Phase transition heat. Degree of dryness. Melting. Sublimation. PT diagram of a phase transition. Tertiary point. Specific volume, enthalpy, entropy of wet saturated, dry and superheated steam. Thermodynamic tables

of water and water vapor. the main processes of steam generation. Humid air. Water vapor PV, TS, hs diagrams

Module 4. Basics of heat exchange

Topic 8: Basics of heat exchange. Basic concepts. Basics of heat transfer: heat conduction, convective heat exchange, radiation.

Topic 9: Basics of convective heat transfer. Convective heat exchange. A free convention. Forced convection. Newton-Richmann equation. Reynolds, Prandtl, Nusselt, Grashof criteria. Understanding of thermal and hydrodynamic boundary layers. Radiation. Basic laws of heat transfer by radiation method. Laws of Planck, Wien, Stefan-Bolsmann, Kirchhoff, Lambert.

Topic 10: Radiation . Basic laws of heat exchange by radiation method . Laws of Planck, Wien, Stefan-Bolsmann, Kirchhoff, Lambert.

Module 5. Heat energy devices.

Topic 11 : Heat exchange devices. Types of heat exchangers. Recuperative, regenerative and mixed heat exchange devices. Hydrodynamic calculation of heat exchangers.

Topic 12: Compressor. compressors, general information, principle of operation air drawing of CO-7A compressor, FIK

Topic 13: Refrigeration machines and their cycles .

Topic 14: Fuel. Properties of fuel. Solid, liquid and gaseous fuel.

Topic 15: Heat pumps

2.3 Instructions and recommendations for practical training.

The following topics are recommended for practical training:

1. Basic thermodynamic state parameters.
2. Ideal gas mixtures.
3. Isothermic , isothermal , isothermal _ _ processes, adiabatic and polytropical processes .
4. Circular processes. Carnot cycle.
5. Internal combustion engine cycles.
6. Thermal conductivity of flat walls and cylindrical walls.
7. Heat transfer.
8. Heat exchange devices.

Practical training should be conducted by one professor-teacher for one academic group in an auditorium equipped with multimedia devices. It is desirable that the classes are conducted using active and interactive methods, appropriate pedagogic and information technologies are used.

2.4 Instructions and recommendations for laboratory work.

The following topics are recommended for laboratory work:

1. Pressure and temperature measuring devices.
2. Determination of heat capacity of air.
3. Determination of thermal conductivity coefficient of insulating material in the form of a pipe.
4. Determination of the heat transfer coefficient of a horizontal pipe.
5. Introduction to the structure and operation of the CO-7A compressor.

2.5 Instructions and recommendations on course work (project).

Course work (project) is not planned.

2.6. Independent education and independent work.

1. Ideal gas equation of state .

	2. I deal with gas mixtures . 3. Heat capacities of I deal gases 4. The first law of thermodynamics. . 5. Isothermic , isothermal , isothermal _ _ processes, adiabatic and polytropical processes . 6. The II law of thermodynamics. 7. Circular processes. Carnot cycle. 8. Thermal conductivity of flat walls and cylindrical walls. 9.I thermal conductivity. 10. Radiation laws. 11. Basic laws of heat transfer by radiation method. Laws of Planck, Wien, Stefan-Bolsman, Kirchhoff, Lambert. 12. Heat exchange devices. 13. Steam and gas turbine devices. 14. Compressor devices. 15. Internal combustion engines, heat energy devices.
3.	**3. Results of science education (competencies to be formed).** 3.1. As a result of mastering the subject, the student: • To have an idea about heat, heat-related processes and devices, processes that go with them; • to know the types and methods of mathematical modeling, the requirements for mathematical models and to have the skills to use them; • should have the ability to study and analyze existing problems in heat energy processes and devices and to adopt preliminary solutions to existing problems
4	**4. Educational technologies and methods:** • lectures; • interactive case studies; • seminars (logical thinking, quick questions and answers); • work in groups; • making presentations; • individual projects; • projects for teamwork and advocacy.
5.	**5. Requirements for obtaining loans:** To be able to fully master the theoretical and methodological concepts of science, to accurately reflect the results of the analysis, to independently observe the studied processes and to perform the tasks and assignments given in the current and interim control forms, and to write on the final control submit work.
6.	**6. Literature.** 1. S. Kleein., G. Nellis. Thermodynamics. Cambridge, 2012. 2. G'.N.Uzokov, DNMamedova, Sh.K.Yakhshiboyev, HAAlmardanov. A collection of experiments on " Thermodynamics and heat engineering". Study guide.- K arshi: Intellect , 2021. 3. G'.N.Uzokov, DNMamedova, Sh.K.Yakhshiboyev, HAAlmardanov. Instruction manual for conducting practical training in "Thermodynamics and heat engineering". Study guide. - K arshi: Intellect, 2021.

	4. Zohidov RA, Alimova MM, Mazhudovova Sh.S., "Theoretical basis of thermal engineering" . Study manual, - Tashkent: Publishing House of the National Society of Philosophers of Uzbekistan, 2010. 5. Zoxidov R., Avezov R.R., Vardiyashvili A.B., Alimova M.M., "Theoretical basis of heat engineering" textbook, part 1.-T: TDTU, 2005. 6. Zoxidov R., Alimova M.M., Mazhudovova Sh.S. A collection of problems in the science of technical thermodynamics and heat transfer.-Tashkent: TDTU, 2006. ***Additional literature*** 7. Mirziyoev Sh.M. We will build a free and prosperous, democratic country of Uzbekistan together. Speech at the joint meeting of the chambers of the Oliy Majlis dedicated to the inauguration ceremony of the President of the Republic of Uzbekistan. T.-"Uzbekistan" NMIU, 2016.-56 p. 8. Mirziyoev Sh.M. We will build our great future together with our brave and noble people.-T.-"Uzbekistan" NMIU, 2017.-488 p. 9. On the strategy of actions for further development of the Republic of Uzbekistan. - T. Decree No. PF-4947 of February 7, 2017. 10. Zohidov RA, Alimova MM, Mazhodova Sh.S., Isakhodjaev XS, "Theoretical foundations of heat engineering". Study guide, - Tashkent.: Cholpon, 2006. 11. Koroli M.A., Mazhudova Sh.S. Modern pedagogical technologies. Methodological development.-Tashkent.:TDTU, 2003. 12 . Pod ed. Zakharovoy A.A. Technicheskaya thermodynamics and thermotechnics.-M.: Academy, 2006. **Internet sites** 1. www. gov . uz - the government portal of the Republic of Uzbekistan. 2. www.lex.uz - National database of legal documents of the Republic of Uzbekistan. 3. www. Zionet.uz 4. htt//dhes. i m em rsu.ru/studies/tot/ I it.htm l ; 5. htt// rbip . bookchamber .ru/ de s cription.aspx?product.no=854 ; 6. www. temperature . org.
7	Science program of the Scientific Council of the Anti-Engineering Institute of Economics in 2022 year " 28.06 " Approved by the decision No.11. Scientific program of the department "Alternative energy sources" No20/1 dated 2022 year 23.06, methodical commission of the "Energy" faculty No11 dated 2022 year 24.06 and Stylistic Council of the institute No. 11 dated 2022 year 25.06 - considered in numerous meetings.
8	**Responsible for subject/module:** **HAAlmardanov** - *"Alternative energy sources" head teacher*
10	**Reviewers:** Uzokov G'.N. - Professor of the Department of "Alternative Energy Sources" of KEII **AA Vardyashvili -** Head of the Department of "Alternative and Renewable Energy Sources" KarSU