REPUBLIC OF UZBEKISTAN

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS

FERGANA STATE TECHNICAL UNIVERSITY

Heat Engineering

MODULE HANDBOOK

Field of knowledge:	700000	- Engineering, Manufacturing, and Construction
Field of Education:	730 000	- Architecture and Construction
Educational Program:	60730300	- Civil Engineering

Fergana 2025

Module title	***Heat Engineering***
Code (if available)	*HeatEngineerM44*
Semester(s) of module teaching	*4*
Responsible for the module	*Madaliyev Erkin O'rinboyevich,* *Department of Construction of Engineering Communications,* *PhD in Technical Sciences, Associate Professor* *Mullayev Ikromjon Isroiljonovich,* *Department of Construction of Engineering Communications,* *Senior Lecturer*
Language of instruction	*Uzbek*
Connection to the curriculum	*Compulsory*
Teaching methods	*lecture, practical training, laboratory training, independent study.*
Study load (including classroom and independent study hours)	*Total hours: 120 hours* *Auditorium hours: 48 hours* *lecture – 20 hours, practical training – 22 hours, Laboratory Training-6 hours, independent training-72 hours.*
Credit units	***4***
Required and recommended prior knowledge for studying the module	*Physics, Higher mathematics*
Module objectives/intended learning outcomes	***Module Objective:*** *To teach students the fundamental concepts of thermal engineering, including thermodynamic systems and working substances, the laws of thermodynamics, thermodynamic processes, and types of heat transfer (conduction, convection, and radiation), as well as to develop skills in applying them in practice.* *To achieve this objective, the course aims to develop students' theoretical knowledge, practical skills, methodological approaches to studying thermodynamic processes, and scientific worldview.* ***Requirements for students' knowledge, skills, and competencies in this subject are as follows. The student must:*** *• understand the basic concepts of technical thermodynamics, the laws of technical thermodynamics and thermodynamic processes, the first law of thermodynamics, the law of conservation and transformation of energy, internal energy, and the heat capacity of gases;* *• have practical skills regarding working substances, state parameters, the relationship between pressure and temperature, fundamental laws and principles of heat conduction, temperature fields, Fourier's law, heat flow, steady-state heat conduction, heat transfer in single-layer flat walls and multilayer flat walls;* *• be able to define and apply the parameters of moist air, the thermal conductivity coefficients of thermal insulation materials, types of heat exchangers, heat balance, and the heat transfer coefficient.*
Content	***Lecture topics***

	1. *Purpose and objectives of the subject. Thermodynamic system and working substance.* 2. *Heat capacity.* 3. *Ideal gas mixtures.* 4. *First law of thermodynamics. Internal energy. Expansion work.* 5. *Second law of thermodynamics. Carnot cycle. Carnot theorem. Direct and reverse cycles.* 6. *Thermodynamic processes: isobaric, isochoric, isothermal processes, adiabatic and polytropic. Pv and Ts diagrams of processes.* 7. *Heat conduction. Convective heat transfer. Radiative heat transfer.* 8. *Water vapor. Main properties of water vapor. Saturated, wet saturated, dry saturated, and superheated steam.* 9. *Humid air. Main properties of humid air. Relative humidity. Absolute humidity. h–d diagram.* 10. *Calculation of heat exchangers.* ***Practical Training topics*** 1. *Problems related to state parameters.* 2. *Problems related to the laws of ideal gases.* 3. *Problems related to heat capacity.* 4. *Problems related to ideal gas mixtures.* 5. *Problems related to the first law of thermodynamics.* 6. *Problems related to the second law of thermodynamics.* 7. *Problems related to thermodynamic processes.* 8. *Problems related to heat conduction and convective heat transfer.* 9. *Problems related to radiative heat transfer.* ***Laboratory Work Topics*** 1. *Determining the parameters of humid air.* 2. *Determining the thermal conductivity coefficient of thermal insulation materials.* 3. *Calculation of heat exchangers.*
Forms of assessment	*oral, presentation, written work, practical assignments, laboratory work, and final exams.*
Requirements for study and assessment	*To successfully complete the module, the student must attend classes and achieve the minimum scores in the current, intermediate and final assessments.*
Bibliography	*1. Madaliev E.O‘. Issiqlik texnikasi. Oliy o‘quv yurtlari uchun darslik. “Farg‘ona” nashriyoti, 2012.-322 b.* *2. Zohidov R.A., Alimova M.M., Mavjudova SH.S. Issiqlik texnikasi. Oliy o‘quv yurtlari uchun darslik. “O‘zbekiston faylasuflari milliy jamiyati” nashriyoti, 2010.-195 b.* *3. Xudoyberdiyev T.S., Shaymardanov B.P., Abduraxmonov R.A., Xudoyorov A.N., Boltaboyev B.R. Issiqlik almashinish va issiqlik texnikasi. Oliy o‘quv yurtlari uchun o‘quv qo‘llanma, Cho‘lpon nomidagi nashriyot- matbaa ijodiy uyi, Toshkent, 2008-215b.* *4. A.R.Zahidov. Issiqlik almashuvi asoslari. O‘quv qo‘llanma. Farg‘ona Classic nashriyot-2020 y. 144 bet.* *5. Ablyalimov O.S. Termodinamika. Oliy o‘quv yurtlari uchun o‘quv qo‘llanma. “O‘zbekiston xalqaro islom akademiyasi” nashriyot-matbaa birlashmasi Toshkent – 2020. -192 b.*

	6. Островская А. В., Королев В. Н. Теоретические основы теплотехники. Техническая термодинамика. Учебное пособие. Екатеринбург Издательство Уральского университета 2020. 243 стр. *7. Fundamentals of Engineering Thermodynamics 2019-1036 p.* *8. Madaliyev E.O‘., Yunusaliyev E.M.,* *9. Madaliyev M.E. Issiqlik texnikasi fanidan masalalar to‘plami -. Oliy o‘quv yurtlari uchun o‘quv q o‘llanma:Farg‘ona 2019.-258 bet.* *10. Rajput R. K. ENGINEERING THERMODYNAMICS. For Engineering Students of All Indian Universities and Competitive Examinations. NEW DELHI BOSTON, USA 2018* *11. 10. Рабинович О.М. Сборник задач по технической термодинамике. - М., Машиностроение. 1991,- 376 с.*
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