Course title	Heating, Ventilation and Air-Conditioning Systems (ECTS 14)
Subject/module code	IVHTK356714
Semester(s) in which the course is taught	5th, 6th and 7th semesters (2026–2027 academic year)
Assigned instructor	Saydullayev S., acting associate professor; Xolboyev Y., assistant, Department of Engineering Communications
Language of instruction	Uzbek
Course type	Compulsory
Study workload (including independent study)	**Total workload – 420 hours** **Contact hours – 168** Lecture hours – 72 (24 per semester) Laboratory hours – 24 (6th semester) Practical class hours – 72 (24 per semester) **Independent study – 252 hours** (5th semester – 80; 6th semester – 100; 7th semester – 72) Course work – 5th semester; course project – 6th semester
ECTS	14 (5th semester – 4; 6th semester – 6; 7th semester – 4)
Course aims and objectives / learning outcomes	**The aim of teaching the course "Heating, Ventilation and Air-Conditioning Systems" is to develop students' theoretical knowledge and practical skills in providing the microclimate parameters required in buildings and structures; in studying the structure, operating principles and main elements of heating, ventilation and air-conditioning systems; and in calculating and designing these systems and selecting, installing, adjusting and operating their equipment.** **The objective of the course "Heating, Ventilation and Air-Conditioning Systems" is to teach students the operating principles, structure and main equipment of heating, ventilation and air-conditioning systems used to create the required microclimate conditions in buildings and structures, and to develop theoretical knowledge and practical skills in calculating and designing these systems and in selecting, installing, adjusting and technically operating the relevant equipment.** **Prerequisites:** **1. Knowledge of the fundamentals of physics, heat engineering and thermodynamics.** The student should have initial theoretical knowledge of temperature, pressure, quantity of heat, heat exchange, energy, humidity and thermodynamic processes. This knowledge serves as the basis for understanding heat and mass transfer processes in heating, ventilation and air-conditioning systems. **2. Knowledge of engineering mathematics and the fundamentals of technical drawing.** The student should have initial skills in performing mathematical calculations, working with formulas and graphs, reading technical drawings and understanding engineering schemes. This knowledge is needed to calculate heating, ventilation and air-conditioning systems, select equipment, draw up schemes and design systems. **Learning outcomes:** **Professional competencies:** **1. Competence in designing heating systems.** Is competent to determine the heat loads of buildings and structures, calculate the main parameters of heating systems, select heating devices and equipment, and design heating systems in accordance with current regulatory requirements. **2. Competence in designing ventilation and air-conditioning systems.** Is competent to determine the air exchange and microclimate parameters of rooms, calculate the main parameters of ventilation and air-conditioning systems, select the appropriate equipment and design systems on the basis of modern engineering solutions.

	3. Competence in the efficient operation of heating, ventilation and air-conditioning systems. Has the professional competence to install, commission, adjust and technically test engineering systems, assess their performance, detect and eliminate faults, and ensure energy-efficient and environmentally safe operation. **Skills:** **4. Skill in calculating heating systems and selecting equipment.** Is able to determine the heat loads of buildings and rooms, calculate the main parameters of a heating system, and select heat emitters, pipes, heat exchangers and other equipment on the basis of their technical characteristics. **5. Skill in calculating and designing ventilation and air-conditioning systems.** Is able to determine the required air exchange in rooms, calculate air parameters, select the main elements of ventilation and air-conditioning systems, and develop air duct layouts and schematic diagrams of the systems. **6. Skill in installing and operating engineering systems.** Has practical skills in installing, commissioning, adjusting and technically testing heating, ventilation and air-conditioning systems, detecting and eliminating faults, carrying out maintenance and ensuring energy efficiency.
Course content (topics)	**I. Main theoretical section (Lectures) – 72 hours** **5th semester – 24 hours** **Topic 1: Introduction to the course. (2 hours)** Development of heating systems in the Republic of Uzbekistan and its main stages. Current state of ventilation engineering abroad and in the Republic of Uzbekistan. Prospects for the future development of heating in the Republic of Uzbekistan. [1, 2] **Topic 2: Modern technologies and theoretical foundations of heating systems. (2 hours)** Convective and radiant heating systems. Basic principles of the thermodynamics of heat carriers. [4, 5] **Topic 3: Thermal regime of a heated building. (2 hours)** Method of determining heat losses through individual enclosing elements of a room under steady-state conditions. Determining the amount of heat lost in heating outdoor air infiltrating through external enclosures. [3, 4] **Topic 4: Thermodynamic and physico-mathematical description of heat processes in heating systems. (2 hours)** Modelling of heat processes in the elements of central heating systems. Determining the heat transfer coefficient of heat emitters. Heat flux density of heat emitters. Thermal calculation of heat emitters. [1, 2] **Topic 5: Water heating systems. (2 hours)** Local heating systems. Heating of high-rise buildings. Decentralised water-to-water heating systems. Calculation of the natural circulation pressure in a water heating system. Calculation of the circulation pressure in a pumped water heating system. Basic principles of the hydraulic calculation of water heating systems. Various methods of hydraulic calculation of water heating systems. [2, 3] **Topic 6: Steam heating. (4 hours)** Steam heating systems, their schemes and equipment. Selecting the initial steam pressure in the system. Hydraulic calculation of low- and high-pressure steam pipes. Hydraulic calculation of condensate pipes. Steam–water heating systems. Advantages and disadvantages of steam heating systems. [1, 2] **Topic 7: Air heating. (4 hours)** Air heating systems and their specific features. Quantity and temperature of air for heating. Local air heating systems. Specific

features of air duct calculation in central air heating. [2, 4]

Topic 8: Panel radiant heating. (2 hours)

Panel radiant heating systems. Heat exchange in a room with panel radiant heating. Design of heating panels. Schemes and heat carriers of heating panels. Heat transfer calculation of heating panels. Scientific foundations of panel heating systems. Technology of heating rooms using modern underfloor pipes. [3, 4]

Topic 9: Local heating. (4 hours)

Gas-fired heating stoves. Gas water heaters. Gas-fired non-storage heaters. Electric heaters. Electric storage heating. Electric heating using heat pumps. Combined heating using electricity. Occupational safety when using local heating systems. Scientific and practical importance of gas and electric heating. [1, 2]

Topic 10: Fundamentals of improving the efficiency of heating systems. (4 hours)

Operating mode of a heating system and its adjustment. Control of heating system operation. Specific features of the operating modes and control of various heating systems. Reliability of the heating system. [2, 3]

Topic 11: Theoretical foundations of energy saving in heating systems. (2 hours)

Methods of saving heat used for heating. Improving the efficiency of a building heating system. Use of heat pump installations for heating. Saving heat through automation of the heating system. Intermittent heating of buildings. [1, 3]

Topic 12: Fundamentals of using natural and waste heat in heating systems. (2 hours)**

Low-temperature heating systems. Solar heating systems. Geothermal heating systems. Heating systems using waste heat. [1, 2]

6th semester – 24 hours

Topic 1: Introduction. Importance and methods of the course "Heating, Ventilation and Air-Conditioning Systems". (4 hours)

A brief history of the development of the course and its close links with other disciplines. [2, 3]

Topic 2: Structural and schematic diagrams of ventilation and air-conditioning systems of residential, industrial and public buildings. (4 hours)

Structural design of supply and exhaust ventilation and air-conditioning elements and individual units. Introduction to the configuration of air supply systems. Structural and schematic diagrams of ventilation and air-conditioning systems. [1, 2]

Topic 3: Selection and calculation of the equipment of exhaust and supply ventilation systems. (4 hours)

Dust removal equipment. Classification of air filters for cleaning outdoor and recirculated air. Classification of dust collectors for cleaning dusty emissions. Selection of dust removal equipment. [2, 3]

Topic 4: Air heating devices. (2 hours)

Air heating devices. Design and classification of air heaters. Design of air heater installations. Calculation of air heaters. [1, 3]

Topic 5: Local ventilation systems. (2 hours)

Devices and equipment used in local ventilation systems. Local exhaust devices and air showers. [1, 3]

Topic 6: Central ventilation systems. (2 hours)

Local exhaust devices and air showers. [1, 3]

Topic 7: Pneumatic conveying systems for waste. (2 hours)

Classification of pneumatic conveying systems and information about them. Main equipment and air ducts of pneumatic conveying systems. [2, 3]

	Topic 8: Aeration of industrial buildings. (4 hours) Methods of calculating air exchange. Aeration of multi-storey and multi-span residential buildings. **Topic 9: Air curtains and their classification. (2 hours)** Classification of air curtains and the requirements for them. Calculation and use of air curtains. [2, 4] **Topic 10**: Chiller–fan-coil air-conditioning systems. (4 hours)** Structure of air-conditioning systems; chiller–fan-coil air-conditioning systems. [1, 4] **Topic 11: Noise and vibration control in ventilation systems. (2 hours)** Physical and physiological characteristics of noise. Noise control in ventilation systems. Silencers (noise attenuators). [2, 3] **Topic 12: Testing, adjustment and operation of ventilation and air-conditioning systems. (2 hours)** Testing and adjustment of ventilation and air-conditioning systems. Technical and sanitary-hygienic testing of ventilation and air-conditioning systems. Testing of the units of ventilation and air-conditioning systems. [1, 3] **7th semester – 24 hours** **Topic 1: Introduction. Importance and methods of the course "Heating, Ventilation and Air-Conditioning Systems". (4 hours)** A brief history of the development of the course and its close links with other disciplines. [2, 3] **Topic 2: Sanitary-hygienic and technological requirements for the air regime of rooms. (4 hours)** Main types of harmful substances and their effects on the human body. The nature of the effects of heat, gases and dust on the human body. [2, 3] **Topic 3: Design parameters of indoor and outdoor air. (4 hours)** Selection of the design parameters of indoor and outdoor air for the design of ventilation and air-conditioning systems on the basis of QMQ and ShNQ (national building codes), industry standards, standards and technical specifications. [1, 2] **Topic 4: Classification of ventilation systems. (2 hours)** Classification of ventilation systems and types of ventilation systems according to their field of application. [1, 3] **Topic 5: Properties of air and processes of change in its state. (2 hours)** Properties of moist air. Chemical composition. Main thermodynamic characteristics. [1, 4] **Topic 6**: Representation of heat and mass transfer processes on the I–d (psychrometric) chart. (2 hours)** The I–d chart of moist air. Construction of the chart. Representation of heat and mass transfer processes on the chart. Air heating and humidification processes. [1, 2] **Topic 7: Harmful emissions released in a room and determination of their quantity. (2 hours)** Thermal regime of a room. Brief description and properties of harmful substances; determining the quantity of gases and vapours released. [1, 2] **Topic 8: Methods of determining the air exchange rate. (4 hours)** The calculation method of determining air exchange. Calculation of air exchange by the standard air change rate and by the standard specific supply air flow rate. [2, 3] **Topic 9: Aerodynamic fundamentals of air exchange in a room. (2 hours)** Classification of air jets. Aerodynamics of free air jets. Aerodynamics

	of confined jets. Discontinuous jets. [2, 3] **Topic 10: Aerodynamic fundamentals of ventilation systems. Aerodynamic calculation of air ducts. (4 hours)** General concepts: purpose of the aerodynamic calculation of air ducts. Pressures in ducts with air flow. Friction pressure loss. Pressure loss in local resistances. Sequence of the aerodynamic calculation of air ducts. [1, 4] **Topic 11: Structure of air-conditioning systems. (2 hours)** Structure and design of air-conditioning systems. [1, 2] **Topic 12**: Air conditioning. (2 hours)** Schematic diagrams of air-conditioning systems; sources of cooling for air-conditioning systems. [2, 3] ** Topics developed on the basis of the curricula of universities ranked in the TOP-300 of the QS and THE rankings: Technical University of Munich (TUM, Germany; QS – 28, THE – 30), Department of Energy and Process Engineering – 5th semester, Topic 12 (solar thermal and photovoltaic-thermal (PVT) collectors; geothermal heat pump systems; technologies for recovering industrial waste heat); Indian Institute of Technology Kharagpur (QS – 222, THE – 401–500), course "Refrigeration and Air Conditioning" (Prof. M. Ramgopal, NPTEL) – 6th semester, Topic 10; 7th semester, Topics 6 and 12 (vapour absorption refrigeration cycles; cooling tower calculation; worked examples of psychrometric processes). **II. Guidelines and recommendations for practical classes – 72 hours** Practical classes consolidate the theoretical material of the lectures and develop students' skills in calculating and designing heating, ventilation and air-conditioning systems and selecting their equipment. **5th semester – 24 hours (2 hours each):** 1. Calculation of heat losses through external enclosures. 2. Determining the specific heating characteristic of a building. 3. Aggregated calculation of building heat losses. 4. Thermal calculation of heat emitters. 5. Determining the available pressure. 6. Methods of hydraulic calculation of water heating systems. 7. Balancing pressure losses in circulation loops. 8. Calculation of a low-pressure steam heating system. 9. Calculation of a high-pressure steam heating system. 10. Selection of special equipment. 11. Calculation of air heating systems. 12. Calculation of a panel radiant heating system. **6th semester – 24 hours (2 hours each):** 1. Calculation of air heaters. 2. Dust collectors and their calculation. 3. Building aerodynamics. 4. Calculation of local exhaust devices. 5. Methods of calculating air exchange. 6. Classification and calculation of air curtains. 7. Calculation of a pneumatic conveying system. 8. Silencers and their calculation. 9. Insulation materials for ventilation systems. 10. Technical testing of ventilation systems. 11. Calculation and selection of autonomous air conditioners. 12. Sequence of testing and adjustment of ventilation systems. **7th semester – 24 hours (2 hours each):** 1. Selection of the design parameters of indoor and outdoor air when designing a ventilation system. 2. Main factors in selecting a ventilation system for buildings.

	3. The I–d chart of moist air. 4. Calculation of heat and mass transfer processes on the I–d chart. 5. Study of the balance equations for air and harmful substances in a room. 6. Calculation of the quantity of harmful substances released in a room. 7. Calculation of the supply air flow rate to a room by the calculation method. 8. Calculation of the supply air flow rate to a room by the standard method. 9. Identification of types of air jets. 10. Schemes for organising air exchange in buildings. 11. Study of air pressure dynamics in a ventilation system. 12. Aerodynamic calculation of air ducts. **III. Laboratory classes – 24 hours (6th semester, 2 hours each)** 1. Safety rules. Familiarisation with the design and equipment of the 571800-UZ "Heating system" training rig. 2. Filling a water heating system with water, venting air and starting it up. 3. Starting up an underfloor heating loop and measuring its parameters. 4. Measuring air flow through a calibrated section. 5. Investigating the frictional resistance of a circular air duct. 6. Determining the velocity in a manifold. 7. Investigating changes in air temperature. 8. Studying the design and operating principle of a ventilation unit. 9. Studying the operation of a heat exchanger. 10. Familiarisation with instruments for determining air parameters. 11. Familiarisation with the full and partial air-conditioning training rig. 12. Determining the capacity of an air heater. **IV. Independent study – 252 hours** Independent study develops students' ability to learn autonomously, to work with scientific and technical literature, regulatory documents and electronic resources, and to apply the knowledge gained in professional activity. Assignments are completed under the teacher's guidance in traditional or electronic form. **5th semester – 80 hours (8 hours each):** 1. Level of thermal protection of external enclosures. 2. Climatic characteristics of the outdoor environment in the cold season. 3. Heat gains in a room; heat required to warm cold materials. 4. Calculation of heat losses through enclosures in special cases: when they are air-permeable, when water vapour condenses on their surface, and when they are intensely irradiated. 5. Heat losses of underground structures. 6. Taking into account the specific features of the thermal regime when selecting heating systems. 7. Thermal stability of a room under intermittent heating. 8. New heating systems and their technical and economic indicators. 9. Vacuum-steam and sub-atmospheric heating systems. 10. Use of flash steam. **6th semester – 100 hours (10 hours each):** 1. Structural solutions of residential ventilation systems. 2. Structural solutions of ventilation systems in public buildings. 3. Air ducts and their installation. 4. Air distributors and their calculation. 5. Air heaters.

6. Fans.
7. Noise control in ventilation systems.
8. Modern local air conditioners.
9. Modern central air conditioners.
10. Air-cooling machines.

7th semester – 72 hours:

1. Selection of design outdoor and indoor air parameters from regulatory documents. (8 hours)
2. Calculation of the heat flow entering a room through windows due to solar radiation. (8 hours)
3. Calculation of the heat flow entering a room through the ceiling due to solar radiation. (6 hours)
4. Drawing up the heat and moisture balance of a room. (8 hours)
5. Methods of determining air exchange. (6 hours)
6. Properties of moist air. (8 hours)
7. The I–d chart of moist air. (6 hours)
8. Representation of changes in the state of moist air on the I–d chart. (8 hours)
9. Determining air exchange on the basis of processes on the I–d chart. (6 hours)
10. Organisation of air exchange. (8 hours)

V. Course work (5th semester)

The aim of the course work is to develop students' ability to work independently, to build practical skills in applying the theoretical knowledge gained, to make technical decisions suited to real production conditions, and to gain skills in using modern equipment and technologies.

The course work deepens students' theoretical knowledge (heat conduction, hydraulics, thermodynamics) and develops skills in thermal calculation and system selection suited to real conditions and in working with modern heating equipment (boilers, plate heat exchangers, pumps, automation).

The graphic part of the course work includes: floor plans of the building (showing the location of heat emitters and mains); a basement (or attic) plan; an axonometric diagram of the heating system (with supply and return pipes, risers and heat emitters); heat emitter connection details; and the connection diagram of the heat entry point (individual heating substation) or boiler house.

Volume of the calculation and explanatory note – 20–25 pages. Number of drawings – 1–2, in A2 format.

The explanatory note includes:

– selection of the design parameters of indoor and outdoor air for designing the heating system of the selected building and region;

– calculation of the thermal resistance of the building's external enclosing structures (walls, windows, roof, floor);

– selection of the type and scheme of the heating system (one-pipe/two-pipe, top/bottom distribution, water/panel, etc.);

– selection of the type of heat emitters (radiators, convectors or underfloor heating) and calculation of their surface area (number of sections);

– calculation and selection of the main and auxiliary equipment of the heating system (circulation pumps, expansion tank, heat exchangers, mixing units and control valves).

Indicative topics recommended for the course work:

– description of the building and regulatory parameters (SNiP / O'zDSt);

– tables of outdoor air temperatures and indoor temperatures;

– selection of heat emitters (radiator sections, convector capacity);

	– pipe layout (shown in the drawings). **VI. Course project (6th semester)** The aim of the course project is to develop students' ability to work independently, to build practical skills in applying the theoretical knowledge gained, to make technical decisions suited to real production conditions, and to gain skills in using modern equipment and technologies. A comprehensive course project on ventilation and air-conditioning systems is provided in order to deepen and consolidate students' theoretical knowledge and to develop their skills in working with technical, reference and regulatory literature. Volume of the calculation and explanatory note – 25–30 pages. Number of drawings – 1–2, in A2 format. The graphic part of the course project includes floor plans of the building showing the ventilation and air-conditioning systems, and axonometric diagrams of the supply and exhaust ventilation systems with their equipment. The explanatory note includes: selection of indoor and outdoor air parameters for the ventilation and air-conditioning systems of the selected building; determination of the quantity of harmful substances and the air exchange rate; selection of the air distribution scheme; aerodynamic calculation of the supply and exhaust ventilation systems; calculation and selection of the equipment of ventilation and air-conditioning systems; and hydraulic calculation of the chilled and hot water pipes supplying the air-conditioning systems. Indicative topics recommended for the course project: – calculation of a central air conditioner; – calculation for the summer period; – calculation for the winter period; – recirculation system. **VII. Teaching technologies and methods** – lectures; – interactive case studies; – seminars (logical thinking, rapid question-and-answer sessions); – group work; – presentations; – individual projects; – team projects for joint work and defence.
Student assessment	Student assessment is based on the level of mastery of the learning materials during the semester and final assessment (tests, assignments, and written and oral work). In each semester of the "Heating, Ventilation and Air-Conditioning Systems" course, students are assessed on a 100-point scale. Of this total, 50 points are allocated to current and midterm assessment (60% of these 50 points for ongoing assessment and independent study, and 40% for the midterm assessment), while 50 points are allocated to the final assessment. Students whose combined current and midterm score is below 30 points are not admitted to the final examination. A student who obtains 30 or more points in the final assessment is considered to have passed the course. **Assessment criteria:** **a) A grade of "5" (excellent) requires the student to:** – fully explain the essence and content of the course; – present the topics of the course in a scientific and logically consistent manner, without scientific errors or inaccuracies; – have a clear understanding of the theoretical or practical importance of the course material; – demonstrate the ability to think independently and freely within the

	scope of the course; – give clear and concise answers to the questions asked; – have a thoroughly prepared set of lecture notes; – complete independent assignments fully and accurately; – have mastered all the practical skills and competencies; – be able to apply theoretical knowledge in various situations; – take a systematic approach and maintain continuity. **b) A grade of "4" (good) requires the student to:** – understand the essence and content of the course and present its topics without scientific or logical inaccuracies; – understand the practical importance of the course content; – complete the tasks and assignments for the course within the scope of the syllabus; – give correct answers to the questions asked on the course; – have a well-prepared set of lecture notes for the course; – complete the independent assignments for the course in full; – have made an effort to master all the practical skills and competencies. **c) A grade of "3" (satisfactory) requires the student to:** – have a general understanding of the course; – cover the topics of the course within a narrow scope, allowing some inaccuracies in presentation; – complete the independent assignments for the course in full; – the presentation is not fluent; – answers to questions on the course are vague and confused; – the written work on the course is not carefully prepared. **d) A grade of "2" (unsatisfactory) may be given in the following cases:** – the student has not prepared for classes on the course; – the student has no understanding of the content of the classes; – the independent assignments for the course have not been completed in full; – there are signs that written work has been copied from others; – the written work contains serious errors and inaccuracies; – no answers are given to questions on the course, i.e. the student does not know the course.
Examination requirements	To earn the credits, the student must have fully mastered the theoretical and methodological concepts of the course, be able to present the results of analysis correctly, reason independently about the processes studied, complete the tasks and assignments given for assessment, and submit written work for the final assessment. Students who do not submit current assessment, midterm assessment and independent study assignments, or who score fewer than 30 points for these assignments and assessment components, are not admitted to the final assessment. Furthermore, a student who, without a valid reason, misses 25 percent or more of the contact hours allocated to the course will be withdrawn from the course, will not be admitted to the final examination, and will be considered not to have earned the relevant credits for the course. A student who fails the final examination or receives a score in the range of "0–29.9" for this examination is considered to have an academic debt.
Recommended literature	**Main literature:** 1. Mansurova Sh.P. Ventilyatsiya va havoni konditsiyalash tizimlari [Ventilation and Air-Conditioning Systems]. Textbook. – Jizzakh: So‘g‘diyona nashriyot matbaa uyi, 2023. – 153 p. 2. Ismanxodjaeva M.R. Ventilyatsiya va havoni konditsiyalash tizimlari [Ventilation and Air-Conditioning Systems]. Study guide. –

Tashkent: Ijod-Press, 2022. – 315 p.
3. Boboyev S.M., Shukurov G‘.Sh. Isitish [Heating]. Textbook. – Tashkent: Yangi asr avlodi, 2008. – 268 p.
4. Nurmanov S.R., Usmonov Sh.A., Pirnazarov I.I. Ventilyatsiya va havoni konditsiyalash tizimlari [Ventilation and Air-Conditioning Systems]. Study guide. – Tashkent: Ijod-Press, 2019. – 512 p.
5. Rashidov Yu.K. Issiqlik, gaz ta’minoti va ventilyatsiya [Heat and Gas Supply and Ventilation]. Textbook. – Tashkent: Cho‘lpon, 2010. – 143 p.

Additional literature:

6. Mirziyoyev Sh.M. Buyuk kelajagimizni mard va oliyjanob xalqimiz bilan birga quramiz [Together with Our Brave and Noble People, We Will Build Our Great Future]. – Tashkent: O‘zbekiston, 2016. – 486 p.
7. Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini ta’minlash – yurt taraqqiyoti va xalq farovonligining garovi [Ensuring the Rule of Law and Human Interests Is the Guarantee of the Country’s Development and the People’s Well-Being]. – Tashkent: O‘zbekiston, 2016. – 47 p.
8. Ананьев В.А. и др. Системы вентиляции и кондиционирования. Теория и практика [Ananyev V.A. et al. Ventilation and Air-Conditioning Systems: Theory and Practice]. Study guide. – Moscow: Evroklimat; Arina, 2000. – 216 p.
9. Павлов Н.Н., Шиллер Ю.И. Справочник проектировщика. Внутренние санитарно-технические устройства. Ч. 3. Вентиляция и кондиционирование воздуха. Кн. 1 [Pavlov N.N., Schiller Yu.I. Designer’s Handbook. Internal Sanitary-Technical Devices. Part 3: Ventilation and Air Conditioning. Book 1]. – Moscow: Stroyizdat, 1992. – 319 p.

Internet resources

10. www.gov.uz – Government portal of the Republic of Uzbekistan.
11. www.lex.uz – National database of legislation of the Republic of Uzbekistan.
12. www.mc.uz – Ministry of Construction and Housing and Communal Services of the Republic of Uzbekistan.
13. www.ziyonet.uz – Information and educational network of the Republic of Uzbekistan.