Course title	Introduction to the Speciality (ECTS 4)
Subject/module code	MK2304
Semester(s) in which the course is taught	3rd semester (2026–2027 academic year)
Assigned instructor	Musayev Sh., associate professor, PhD; Karimov Y., assistant, Department of Engineering Communications
Language of instruction	Uzbek
Course type	Elective
Study workload (including independent study)	**Total workload – 120 hours** **Contact hours – 48** Lecture hours – 24 Laboratory hours – none Practical class hours – 24 **Independent study – 72 hours** Course project – none
ECTS	4
Course aims and objectives / learning outcomes	**The aim of the course is to develop, in students studying in the construction field at higher education institutions, an understanding of engineering communication systems and of the role of the course in industry.** **The objective of the course is to teach students how to improve engineering communication systems from the standpoint of energy efficiency in line with modern requirements, to justify their use for various purposes, and to gain skills and experience in ensuring energy- and resource-saving technologies in production.** **Learning objectives – the student:** – studies the structure and operating principles of heat supply systems; – knows the basic laws and operating principles of gas supply systems; – masters the types, structure and operating principles of ventilation systems; – is able to calculate heat and gas consumption in heat supply, gas supply and ventilation systems; – is able to determine heat exchange and heat losses; – complies with occupational safety and technical safety requirements when using hydraulic equipment. **Prerequisites: Physics; Mathematics.** **Learning outcomes:** **Professional competencies:** 1. Analyses the basic laws of heat supply, gas supply and ventilation systems. 2. Is able to select heat supply, gas supply and ventilation installations and equipment. 3. Performs the basic calculations of heat exchange, gas flow and air exchange processes. 4. Makes efficient use of heat supply, gas supply and ventilation systems, machines and equipment. **Skills:** 5. Carries out the operation and maintenance of heat supply, gas supply and ventilation systems. 6. Detects and eliminates faults in heat supply, gas supply and ventilation systems. 7. Uses heat supply, gas supply and ventilation equipment in compliance with occupational safety, technical safety and fire safety rules.
Course content (topics)	**I. Main theoretical section (Lectures) – 24 hours** **Topic 1: Engineering communication systems: purpose, classification and role in buildings and settlements. (2 hours)** The concept of engineering communications and their place in the

	built environment. Classification of engineering systems: water supply, sewerage, heat supply, gas supply, ventilation and air conditioning. Interrelation of the systems and their role in providing comfort, safety and sanitary conditions. Professional fields of a specialist in engineering communications. [3, 5] **Topic 2: Historical development of engineering communications in Uzbekistan and modern trends. (2 hours)** Main stages in the development of water, heat and gas supply in Uzbekistan. Modern trends: energy and resource saving, renewable energy sources, digitalisation and automation of engineering systems. Prospects of the speciality in the construction industry. [4, 5] **Topic 3: Regulatory and technical documents for the design of engineering systems. (2 hours)** Construction norms and regulations (ShNQ, QMQ) and state standards applied to engineering communications. Stages and composition of design documentation. Technical specifications, drawings and symbols used in engineering systems. [2, 5] **Topic 4: Sources of water supply. Water intake, treatment and conveyance facilities. (2 hours)** Surface and underground water sources and their characteristics. Water intake structures, water treatment stages and conveyance conduits. Water supply of settlements and industrial enterprises; elements of external water supply networks. [2, 4] **Topic 5: External sewerage networks and wastewater treatment facilities. (2 hours)** Wastewater disposal schemes of settlements: combined, separate and semi-separate systems. Elements of external sewer networks and manholes. Composition of wastewater and the basic stages of its treatment at treatment plants. Discharge of treated water into water bodies. [2, 5] **Topic 6**: Heat losses and heat gains of buildings. Selection of heating, ventilation and air-conditioning systems. (2 hours)** [5, 8] **Topic 7: Pumping stations and pumping equipment: hydraulic characteristics, selection and operating modes. (2 hours)** Role of pumping stations in water supply, sewerage and heat supply systems. Head–flow characteristics of pumps and the system curve. Selection of pumps, parallel and series operation, and regulation of pump operating modes. Basic requirements for the operation of pumping equipment. [4, 10] **Topic 8: Natural gas and gas distribution networks. Gas control stations and indoor gas equipment. (2 hours)** Composition and properties of natural gas. Structure of gas supply systems: trunk pipelines, gas distribution stations and pressure levels of distribution networks. Gas control points and regulators; indoor gas pipelines and gas appliances. Basic rules of safe use of gas. [3, 5, 8] **Topic 9: District heating. Boiler houses, heat networks and heat substations. (2 hours)** Centralised and decentralised heat supply schemes. Types of boilers and boiler house equipment. Open and closed heat networks, heat carriers and thermal substations. Use of heat pumps and solar collectors as alternative heat sources. [4, 5, 10] **Topic 10: Heating systems of buildings. Radiators, underfloor heating and hot water supply. (2 hours)** Classification of building heating systems and their main elements. Heating appliances: radiators, convectors and underfloor heating. Single-pipe and two-pipe systems, hydraulic balancing and individual heat points. Hot water supply systems of residential and public buildings. [3, 5]

	Topic 11: Ventilation and air conditioning. Natural and mechanical ventilation, air-handling units and ducts. (2 hours) Purpose and classification of ventilation systems. Natural and mechanical ventilation; fans, air-handling units and air ducts. Air distribution in rooms and air exchange rates. Central and local air conditioners, split and multi-split (VRF) systems. [2, 7, 9] **Topic 12**: Energy-efficient engineering systems of buildings. Indoor air quality and energy sources. (2 hours)** [2, 5] ** Topics developed on the basis of the curricula of universities ranked in the TOP-300 of the QS and THE rankings: University of Maryland, USA (QS – 112), course ENPM625, and City University of Hong Kong. Topic 6 – calculation of heat loads in buildings and selection of HVAC systems; Topic 12 – design of HVAC systems based on indoor air quality and energy sources. **II. Guidelines and recommendations for practical classes – 24 hours** Practical classes introduce students to the literature of the speciality and to the main engineering communication systems, and develop their initial skills in determining water consumption and wastewater flow. **Recommended practical topics:** 1. Familiarisation with the rules for using literature. (2 hours) 2. Determining water consumption in water supply systems. (2 hours) 3. Determining wastewater flow in sewerage systems. (2 hours) 4. Familiarisation with pumps and pumping stations. (4 hours) 5. Familiarisation with gas supply systems. (2 hours) 6. Familiarisation with heat supply systems. (4 hours) 7. Familiarisation with air exchange systems. (4 hours) 8. Engineering communication facilities. (4 hours) **III. Laboratory classes** Laboratory classes are not provided for in the curriculum of this course. **IV. Independent study – 72 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. **Topics recommended for independent study (8 hours each):** 1. Familiarisation with the structure and rules of the library. 2. Ways of searching for the necessary literature. 3. Familiarisation with the work of the institute's laboratories. 4. Familiarisation with the work of the department. 5. Familiarisation with water supply and wastewater disposal systems. 6. Familiarisation with gas supply systems. 7. Familiarisation with heat supply systems. 8. Familiarisation with ventilation systems. 9. Types of gas water heaters and their fields of application. **V. Teaching technologies and methods** – lectures; – interactive case studies; – seminars (logical thinking, rapid question-and-answer sessions); – group work; – presentations; – individual projects.
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). Throughout the "Introduction to the Speciality" 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 in the current and midterm assessment, and submit the final assessment assignment. 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. Ayupov Sh.A., Rahimov B.X., Yodgorov V.U., Nazarov H.H., Xo'jayeva M.A. Oliy ta'lim me'yoriy hujjatlar to'plami (2-qism) [Collection of Regulatory Documents on Higher Education (Part 2)]. – Tashkent: Sharq, 2003. 2. Gadayev A.N. Suv uzatish va tarqatish tarmoqlarini loyihalash asoslari va muhandislik hisoblari [Fundamentals of Design and Engineering Calculations of Water Transmission and Distribution Networks]. Study guide. – Samarkand: SamSU Publishing House, 2022. 3. Toshmatov N.U. Gaz neft quvurlari, gaz neft omborlari [Gas and Oil Pipelines, Gas and Oil Storage Facilities]. Study guide. – 2023. – 160 p. 4. Tursunov M.K. Issiqlik ta'minoti tizimlari [Heat Supply Systems]. Study guide. – 2023. – 136 p. 5. Toshmatov N.U., Mansurova Sh.P. Issiqlik, gaz ta'minoti va ventilyatsiya asoslari [Fundamentals of Heat and Gas Supply and Ventilation]. Study guide. – 2026. – 132 p. **Additional literature:** 6. Meliyev B.O'. Binolarning muhandislik jihozlari [Engineering Equipment of Buildings]. Textbook. – 2023. – 210 p. 7. Musayev Sh.M. Ventilyatsiya va havoni konditsiyalash [Ventilation and Air Conditioning]. Textbook. – 2023. – 214 p. 8. Toshmatov N.U. Gaz neft quvurlari, gaz neft omborlari [Gas and Oil Pipelines, Gas and Oil Storage Facilities]. Study guide. – 2023. – 140 p. 9. Tursunov M.K. Ventilyatsiya va havoni konditsiyalash tizimlari [Ventilation and Air-Conditioning Systems]. Study guide. – 2023. 10. Musayev Sh.M. Issiqlik ishlab chiqarish uskunalari [Heat Generation Equipment]. Study guide for students of higher education institutions. – Tashkent: Lesson Press, 2021. – 158 p. **Internet resources** 11. www.gov.uz – Government portal of the Republic of Uzbekistan. 12. www.lex.uz – National database of legislation of the Republic of Uzbekistan. 13. https://t.me/archbookuz