Course title	**Equipment and Technology of Fabrication, Welding and Installation Works (ECTS 4)**
Subject/module code	TPMITT4704
Semester(s) in which the course is taught	7th semester (2026–2027 academic year)
Assigned instructor	Qutlimurodov U., associate professor; 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 main aim of the course is to develop students' professional competencies in the technology of fabricating, welding and erecting (installing) metal structures, the technical means used for this work, quality control and safety rules.** **The objectives of the course are that the student:** – studies the technology of fabricating metal structures; – knows the welding methods; – masters the inspection of welds; – acquires the technology of installation (erection) works; – is able to select erection machinery; – complies with occupational safety requirements; – learns to develop process (method) charts. **Prerequisites: Physics; Mathematics.** **Learning outcomes:** **Professional competencies:** 1. Analyses technological processes. 2. Is able to select welding methods. 3. Develops installation (erection) technology. 4. Makes efficient use of construction machinery. **Skills:** 5. Carries out quality control. 6. Ensures industrial safety.
Course content (topics)	**I. Main theoretical section (Lectures) – 24 hours** **Topic 1: Introduction. Purpose, objectives and development prospects of the course "Equipment and Technology of Fabrication, Welding and Installation Works". (2 hours)** Scope of site preparation, welding and installation works. Studying the environment of the construction site. [1, 2] **Topic 2: Preparatory work before the start of building construction. (2 hours)** Studying building designs. Planning technological processes. Trench excavation and pile driving works. [4, 5] **Topic 3: Construction of building foundations. (2 hours)** Trench excavation, pile driving, installation of foundation pads, calculation of foundation footings and selection of machinery. [3, 5] **Topic 4: Physical fundamentals of the welding process. Welding of metallic materials. (2 hours)** Classification and fields of application of electric arc, gas, resistance (contact) and special welding methods. [6, 8] **Topic 5: Types of welding. Welding of non-metallic materials. (2 hours)**

Weldability of plastics and polymer materials. Types of electric welding equipment and other equipment. [4, 7]

Topic 6: Gas welding and thermal cutting technology. (2 hours)

Gas welding and oxygen cutting methods. Gas cylinders, torches, safety rules. [5, 8]

Topic 7: Weld quality and inspection methods. (2 hours)

Types of welds, their defects and the causes of defects. Criteria for assessing the quality of welded joints. [4, 10]

Topic 8: Technology of erecting metal structures. (2 hours)**

Organisation of erection works, erection methods, erection sequence, enlarged (pre-)assembly, methods of ensuring erection accuracy. [5, 7]

Topic 9: Erection machinery and lifting equipment. (2 hours)

Construction cranes, load-handling devices, slings and spreader beams. Rules for selecting and using erection machinery. [6, 8]

Topic 10: Organisation of installation works and technological documentation. (2 hours)**

Work execution plan (PPR), process (method) charts, work scheduling, quality control during erection and organisation of labour. [6, 9]

Topic 11: Occupational health and technical safety in welding and installation works. (2 hours)

Safety requirements in welding and installation works. Fire safety, electrical safety, personal protective equipment, industrial sanitation and environmental requirements. [7, 8]

Topic 12: Modern welding and installation technologies. (2 hours)

Robotic welding, laser and plasma welding, organisation of installation works based on BIM technology, innovative construction technologies and digital manufacturing systems. [4, 8]

** Topics developed on the basis of the curricula of universities ranked in the TOP-300 of the QS and THE rankings: Al-Farabi Kazakh National University (QS – 98, THE – 210), course “Heat Engineering” (Faculty of Thermal Power Engineering, “Energy” programme). Topic 8 – installations, systems and complexes of high-temperature and heat-and-moisture technology; Topic 10 – regulatory and technical documentation and standardisation systems, methods and means of equipment testing and quality control.

II. Guidelines and recommendations for practical classes – 24 hours

Practical classes consolidate the theoretical material of the lectures and develop students’ skills in reading drawings of metal structures, selecting welding methods and parameters, assessing weld quality, selecting erection machinery and preparing technological documentation for installation works.

Recommended practical topics (2 hours each):

1. Studying drawings of metal structures.
2. Designation (symbols) of welds.
3. Selecting welding methods.
4. Calculating electric arc welding parameters.
5. Determining gas cutting parameters.
6. Assessing the quality of welds.
7. Developing erection schemes.
8. Selecting lifting machinery.
9. Preparing a process (method) chart for installation works.
10. Case problems on occupational safety.
11. Technological calculations.
12. Final practical assignments.

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 (6 hours each):** 1. History of the development of welding methods. 2. Modern welding equipment. 3. Laser welding technology. 4. Robotic welding. 5. Defects of welds. 6. Regulatory documents for installation works. 7. Types of construction cranes. 8. Erection of large-panel buildings. 9. Corrosion protection of metal structures. 10. Environmental requirements in welding. 11. Innovative installation technologies. 12. Preparing an essay or presentation on an assigned topic. **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 "Equipment and Technology of Fabrication, Welding and Installation Works" 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. Qutlimurodov U.M. Suv ta'minoti va oqava suvlarni oqizish tizimlari [Water Supply and Wastewater Disposal Systems]. Study guide. – Minus design group LLC, 2021. – 210 p. 2. Musayev Sh.M. Issiqlik ishlab chiqarish uskunalari [Heat Generation Equipment]. Study guide for students of higher education institutions. – Tashkent: Lesson press, 2021. – 158 p. 3. Toshmatov N.U. Issiqlik va gaz ta'minoti tizimlari [Heat and Gas Supply Systems]. Textbook. – Tashkent, 2021. – 234 p. 4. Saydullayev S.R. Binolarning injenerlik kommunikatsiyalari [Engineering Communications of Buildings]. Textbook. – Jizzakh, 2022. – 246 p. 5. Meliyev B.O'. Binolarning muhandislik jihozlari [Engineering Equipment of Buildings]. Textbook for higher education institutions. –

Jizzakh, 2023. – 257 p.

Additional literature:

6. Qodirov Sh.N. Metall konstruksiyalarni montaj qilish texnologiyasi [Technology of Erecting Metal Structures]. Textbook. – Tashkent: O‘qituvchi, 2021. – 167 p.

7. Omonov M. Payvandlash texnologiyalari [Welding Technologies]. – Tashkent: Fan va texnologiya, 2021. – 212 p.

8. Bobojonov N. Sanoatda avtomatlashtirilgan payvandlash [Automated Welding in Industry]. – Samarkand: Ilm-Ziyo, 2022. – 134 p.

9. Yo‘ldashev Sh. Avtomobilsozlikda payvandlash texnologiyalari [Welding Technologies in Automotive Manufacturing]. – Tashkent: Innovatsiya Ziyo, 2021. – 185 p.

10. Current regulatory documents of the Republic of Uzbekistan in the field of construction.

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