Course title	**Causes of Damage to Building and Structure Components and Consequences of Failure (4 ECTS)**
Topic/module code	BIKShSBO1204
Semester(s) in which the course is taught	Semester 1/2
Assigned instructor	Aliyev Mahsrab Rahmonqulovich, Associate Professor
Language of instruction	Uzbek
Course type	Compulsory
Study workload (including independent study)	**Total workload – 120 hours.** **Contact hours – 36 hours.** Lecture hours – 18 Laboratory hours – – Practical class hours – 18 **Independent study – 84 hours**
ECTS credits	4
Course objectives, tasks and learning outcomes	**The main aim of the course** is to develop students' theoretical and practical knowledge of assessing the technical condition of specialised buildings and structures, including damage, failure and deformation occurring in their structural elements, the classification of these conditions, and the causes of their occurrence. **Course objectives:** – The content and objectives of technical assessment; – Deterioration of specialised building structures and the main causes leading to such deterioration; – Factors that adversely affect specialised building structures and their classification; – Natural and man-made (anthropogenic) factors; – Design service life and actual service life of specialised buildings; – Causes of deterioration of metal, timber, concrete and reinforced concrete structures, and preventive measures; – Factors determining the deterioration of specialised building structures and methods for assessing their physical deterioration; – Operational requirements for specialised buildings and their engineering systems; – Procedures for carrying out monitoring and inspection work in specialised buildings; – Technical diagnostics; defects, damage and emergency conditions; – Identification of the causes of damage to structures; – Providing continuous and consistent theoretical and practical instruction o preparing technical reports based on the results of monitoring and inspection worl **Learning outcomes:** 1. Identify and analyse natural, man-made, operational and structural factors that cause damage to building and structure components, and assess their impact on structural reliability. 2. Identify the causes of defects, deformations, cracks, corrosion, failures and emergency conditions in building structures, and analyse how these develop. 3. Assess the technical condition of buildings and structures in accordance with current regulatory documents, analyse operational safety and prepare technical conclusions. 4. Perform a comprehensive assessment of the technical condition of structures using modern technical diagnostics, monitoring and instrumental inspection methods. 5. Develop technical recommendations for the repair, strengthening and reconstruction of damaged structures, and make decisions in accordance with regulatory documents. 6. Carry out visual and instrumental inspections of buildings and structures. 7. Identify and document existing defects, cracks, deformations, corrosion

	and other types of damage in structures. 8. Analyse the causes of damage and assess the extent of its development. 9. Develop engineering recommendations for repairing, strengthening or replacing damaged structures.
Course content (topics)	**I. Main theoretical section (Lectures)** **Topic 1:** Aims and objectives of the course. Basic concepts and definitions related to damage and failure of structures. **Topic 2:** Various types of defects, damage and deformation in building and structure components. **Topic 3:** Types of damage and deformation found in load-bearing building structures, their causes and methods of identification. **Topic 4:** Damage and emergency conditions arising from structural and technological causes and natural disasters. **Topic 5:** Conducting monitoring and inspection work in buildings and structures. **Topic 6:** Technical diagnostic methods for buildings and structures. Aims and objectives of diagnostics. Destructive and non-destructive methods. **Topic 7:** Changes in the technical condition of buildings and structures during operation. Occurrence of emergency conditions. Limit states during operation. **Topic 8:** Operational requirements for buildings and their structural elements. Physical and mechanical deterioration of structures. Development of emergency conditions in structures as a result of deterioration. **Topic 9:** Specific characteristics of the deterioration of various construction materials. Measures to prevent and combat deterioration. **II. Guidelines and recommendations for organising laboratory classes.** Laboratory classes are not included in the curriculum. **III. Guidelines and recommendations for practical classes.** The teacher's preparation for practical classes begins with studying the initial documents (the curriculum, thematic plan and other materials) and concludes with the preparation of a lesson plan. The teacher should have a clear understanding of the aims and objectives of the practical class and the amount of work to be completed by each student. Methodological guidelines are the teacher's principal methodological document for preparing and conducting practical classes. The purpose of practical classes is to understand theoretical concepts and acquire skills. They are intended to develop the ability to apply such knowledge consciously in academic and professional activities and to formulate and substantiate one's own point of view. **Recommended practical topics:** 1. Procedure for commissioning buildings and structures. Defects, damage and deformation found in buildings constructed using local raw materials. 2. Classification of buildings according to wall and floor/roof slab materials. 3. Deterioration of timber structures. Deterioration of metal structures. 4. Deterioration of concrete, reinforced concrete and masonry structures. 5. Loads and actions affecting industrial buildings and measures for strengthening their structures. Tasks involved in increasing structural strength. 6. Strengthening a reinforced concrete floor slab by adding reinforcement in the tension zone. Increasing the strength of a reinforced concrete beam. Determining the need to strengthen an edge column. 7. Fundamentals of using automated structural analysis and design software packages to increase the strength of building and structure components. 8. Key factors determining the serviceability of buildings and structures. Measures applied in construction in seismic regions. 9. Technical report. Conclusions and recommended measures. Aims and objectives of diagnostic work.

	IV. Independent study and individual work. Independent learning competencies help students develop themselves independently and improve the effectiveness of their professional activities. Students complete independent assignments on their mobile devices under the guidance of the instructor, either in the traditional format or electronically. **Recommended topics for independent study:** 1. Classification of factors that adversely affect buildings and structures. 2. Study of the causes that lead buildings and structures to emergency conditions. 3. Defects, damage and deformations characteristic of the functional components of buildings and structures. 4. Assessment of the technical condition of individual structural elements in buildings and structures. 5. Determination of the physical deterioration index of buildings and structures in operation. 6. Determination of the moral (functional) obsolescence index of buildings and structures in operation. 7. Ensuring the required level of reliability of buildings and structures. 8. Assessment of the technical condition of engineering structures and specialised equipment. Technical diagnostics.
Student assessment	Student knowledge is assessed during the semester and in the final assessment based on the level of mastery of the learning materials, as demonstrated through tests, assignments, and written and oral work. Throughout the course "Causes of Damage to Building and Structure Components and Consequences of Failure", students are assessed on a 100-point scale. A total of 50 points is allocated to current and midterm assessment (60% of these 50 points for ongoing assessment and independent study, and 40% for midterm assessment), while the remaining 50 points are allocated to the final assessment. Students who score fewer than 30 points in total in the current and midterm assessments are not admitted to the final examination. A student who scores 30 points or more in the final assessment is considered to have passed the course.
Examination requirements	Students must fully master the theoretical and practical concepts related to the subject and be able to present the results of their analysis accurately. Students must complete the independent work and assignments set as part of the current and midterm assessment. They must also obtain the required scores in current assessment, midterm assessment, independent study and final assessment within the specified period. A student who fails to submit current assessment, midterm assessment or independent study assignments, or who scores fewer than 30 points for these assignments and assessment components, will not be admitted to the final assessment. Furthermore, a student who, without a valid reason, misses 25% or more of the contact hours allocated to the course will be excluded 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 scores between 0 and 29.9 points in this examination is considered to have an academic debt.
Recommended literature	1. *Aliyev M.R.* Bino va inshootlarning texnik holatini baholash. Darslik – Jizzax 2021-y. 2. *To'ychiyev N.J.* Bino va inshootlar konstruksiyalari. Darslik – Voris nashtiyoti. 2010 -y. 3. *Yusupxodjayev S.A.* "Qurilish konstruksiyalari" Darslik Toshkent . "O'zbekiston faylasuflari milliy jamiyati" 2019-yil, 376 bet

	4. *Xodjaev A.A., Xotamov A.T., Yusufxo‘jaev S.A., To‘laganov B.A.* Konstruksiyalarining shikastlanish sabablari va buzilish oqibatlarini aniqlash. O‘quv qo‘llanma. T., 2014. -136 b. 5. *Qosimova S.T.* Binolarni texnik ekspluatatsiyaga xos xususiyatlari. O‘quv qo‘llanma. Toshkent -2003-y. 6. www.mc.uz 7. https://gov.uz/oz/mc/sections/shaharsozlik-normalari-qurilish-va-texnik-reglamentlar 8. www.ZiyoNet.uz