Course title	**Geotechnical Design for Improving the Stability of Buildings (ECTS 4)**
Subject/module code	BUOUGL2204
Semester(s) in which the course is taught	Semester 1/2
Assigned instructor	Alikabulov Shukhrat Abdumalikovich, Doctor of Science (DSc), Professor
Language of instruction	Uzbek
Course type	Elective
Study workload (including independent study)	**Total workload – 120 hours.** Contact hours – 36 hours. Lecture hours – 18 hours. Laboratory hours – –. Practical hours – 18 hours. Independent study – 84 hours.
ECTS	**4**
Course aim, objectives and learning outcomes	**Course aim:** To develop students' knowledge, skills and competencie in assessing the stability of the foundation–soil system of buildings an structures; identifying geotechnical hazards; applying modern geotechnica design methods based on the physical and mechanical properties of soils strengthening foundations; and improving the reliability of buildings. **Course objectives:** To study the interaction between soil and foundations; determine the bearing capacity and deformations of foundations; assess geotechnical hazards; select methods for strengthening existing foundations; develop geotechnical solutions for complex soil conditions; and develop skills in using modern calculation and modelling methods. **Learning outcomes:** 1. Analyse the engineering-geological, hydrogeological and soil conditions of sites intended for the construction of buildings and structures; assess the physical and mechanical properties of soils and determine their effect on building stability. 2. Perform calculations to determine the bearing capacity, settlement, displacement and stability of foundations and soil bases, and assess the calculation results in accordance with regulatory requirements. 3. Select foundation types, soil improvement methods and geotechnical protection measures appropriate to soil conditions, building loads and construction conditions. 4. Develop technical solutions to improve the stability of buildings constructed or operated on weak soils, reduce deformations and prevent geotechnical hazards. 5. Analyse engineering-geological data, determine the physical and mechanical characteristics of soils, and select design soil parameters. 6. Calculate foundation bases by determining soil bearing capacity, building settlement and differential settlement. 7. Select soil improvement methods and assess the applicability of compaction, cementation, grouting, drainage, pile foundations and other geotechnical methods. 8. Use geotechnical analysis software, analyse calculation results and assess the stability of the building–foundation–soil system.
Course content (topics)	**I. Main theoretical part (Lectures) – 18 hours** M1. Theoretical foundations of geotechnical design. The nature and objectives of geotechnics.

	M2. Physical and mechanical properties of the ground and soil. M3. Engineering-geological investigations. M4. Types of foundations and their selection. M5. Rigid and flexible retaining structures. M6. Seismic stability and geotechnical calculations. M7. Ground improvement methods. M8. Geotechnical monitoring and diagnostics. M9. Environmental and economic aspects of geotechnical design. **II. Guidelines and recommendations for laboratory classes** Laboratory classes are not provided for in the curriculum. **III. Practical classes – 18 hours** A1. Identification and assessment of geotechnical hazards. A2. Reading and analysing an engineering-geological report. A3. Determination and classification of design soil parameters. A4. Checking the stability of excavations and slopes. A5. Selection and justification of a retaining structure type. A6. Selection of a foundation type and preparation of a load-transfer scheme to the ground. A7. Calculation and analysis of shallow foundation settlement. A8. Modelling the interaction between the foundation and soil. A9. Selection of a deep foundation solution or a soil improvement method. **IV. Independent study assignments – 84 hours** 1. Modern directions and trends in geotechnical design. 2. Geotechnical hazards during construction near existing buildings. 3. The effect of the physical and mechanical properties of soils on building stability. 4. Methods for ensuring the stability of excavations and trenches. 5. The impact of earthworks on existing buildings and monitoring. 6. Analysis of the causes of landslides and ground collapses. 7. Main types of retaining walls and criteria for their selection. 8. Comparative analysis of flexible and rigid structures. 9. Geotechnical conditions for selecting foundation types. 10. Methods for determining the bearing capacity of the ground. 11. Methods for calculating settlement of shallow foundations. 12. Stress distribution in raft foundations. 13. Types of deep foundations and their fields of application. 14. Modern soil improvement technologies. 15. Construction practices in complex geotechnical conditions.
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 course “Geotechnical Design for Improving the Stability of Buildings”, students are assessed on a 100-point scale. Of these, 50 points are allocated to continuous and midterm assessment (60% of the 50 points for continuous assessment and independent study, and 40% for midterm assessment), while 50 points are allocated to the final assessment. Students who score less than 30 points in the combined continuous and midterm assessments are not admitted to the final examination. A student who scores 30 or more points in the final assessment is considered to have passed the course.
Examination requirements	**Requirements for earning credits:** Students must fully master the theoretical and methodological concepts

	related to the course, accurately present analysis results, independently reflect on the processes under study, complete assignments and tasks set for continuous and midterm assessment, and submit the required final assessment task. **Examination requirements:** The student must have mastered the theoretical and methodological concepts of geotechnical design, be able to analyse the interaction between soil and foundations, and understand the methods used to determine the bearing capacity and deformations of foundations. The student must demonstrate the ability to assess geotechnical hazards, select appropriate solutions for soil and foundations, analyse the results of calculations and modelling, and complete practical class activities and independent study assignments.
Recommended literature	1. Rasulov H.Z. Gruntlar mexanikasi, zamin va poydevorlar. Darslik (2-nashr). Toshkent: “Tafakkur” nashriyoti, 2010. – 262 b. 2. Buzrukov Z.S. Gruntlar mexanikasi, zamin va poydevorlar. O‘quv qo‘llanma. Toshkent, 2009. – 62 b. 3. Mirazimova G.O‘. Gruntlar mexanikasi, zamin va poydevorlar. O‘quv qo‘llanma. Jizzax, 2023. – 205 b. 4. Хасанов А., Хасанов З. Основания и фундаменты на лёссовых просадочных грунтах. Учебник. Ташкент, 2006. – 160 с. 5. Hidoyatov Z.D. Gruntlar mexanikasi, zamin va poydevorlar. O‘quv qo‘llanma (1-qism). Toshkent, 2019. – 133 b. 6. ShNQ 2.01.01-22. Loyihalash uchun iqlimiy va fizikaviy geologik ma’lumotlar. 7. www.mc.uz 8. https://gov.uz/oz/mc/sections/shaharsozlik-normalari-qurilish-va-texnik-reglamentlar 9. www.ZiyoNet.uz