Course name	Engineering Geodesy (ECTS 4)
Topic / module code	IG2404
Semester(s) in which the course is taught	4th semester
Assigned instructor	Karabekov Ulug'bek Abdukarimovich, Senior Lecturer
Language of instruction	Uzbek
Course type	Compulsory
Study hours (including independent study)	**Total hours – 120** **Classroom (contact) hours – 48** Lecture hours – 24 Practical training hours – 24 **Independent study – 72 hours**
ECTS	4
Course goal, objectives and learning outcomes	**Course goal:** to give students the skills to understand the composition of surveying (geodetic) works carried out during the design, construction and operation of various engineering structures, the essence of the methods used, and to apply surveying instruments in practice. **Course objective:** to provide theoretical knowledge and practical skills; to develop scientifically grounded schemes and programs for building efficient surveying networks for the main types of engineering structures; to develop the most effective methods and instruments, based on the latest achievements of science and technology, for conducting engineering surveys and for setting out and adjusting structures; and to generalize domestic and foreign experience in surveying work accumulated in the construction of major engineering structures, teaching students to apply this experience in practice. **Learning outcomes:** 1. Be able to identify the most relevant literature related to engineering geodesy; 2. Be able to analyze theoretical models and understand the underlying mechanisms; 3. Collect data relevant to the subject of engineering geodesy; 4. Be able to apply their own empirical knowledge in the analyses being conducted.
Course content (topics)	**I. Main theoretical part (Lectures)** **Topic 1:** General information about geodesy. **Topic 2:** Orientation of lines on the ground. Direct and inverse geodetic problems on a plane. **Topic 3:** Study of topographic maps. **Topic 4:** The concept of the theory of measurement errors. **Topic 5:** Angle measurement. **Topic 6:** Methods of measuring horizontal and vertical angles and distances on the ground. **Topic 7:** Leveling and area (surface) determination.

Topic 8: Modern surveying instruments and their software.
Topic 9: Geodetic reference (control) networks.
Topic 10: Production of topographic plans.
Topic 11: Engineering survey work for construction.
Topic 12: Types of deformation.

II. Guidelines and recommendations for practical training

The instructor's preparation for the practical session begins with studying the initial documents (curriculum, thematic plan, etc.) and concludes with drawing up the lesson plan. The instructor must have a clear idea of the goals and objectives of the practical session and of the amount of work each student is required to complete.

Methodological guidelines are the instructor's main methodological document for preparing and conducting practical sessions.

The purpose of the practical session is to understand the theory and acquire skills — to consciously apply them in academic and professional activity, and to develop the ability to confidently form one's own point of view.

Recommended practical topics:

1. Coordinate systems. Constructing a coordinate grid, plotting points by coordinates. The projection method in geodesy.
2. Solving orientation problems (orienting lines on the ground, determining true and magnetic azimuths, magnetic needle declination, convergence of meridians).
3. Scale. Types of scale. Scale of topographic maps and plans, small-scale geographic maps.
4. Studying conventional (symbol) signs on topographic maps.
5. Determining the given slope angle or gradient between two points.
6. Studying the construction of theodolites. Calculating the coordinates of a closed theodolite traverse. Calculating the coordinates of an open theodolite traverse.
7. Studying the construction of levels (leveling instruments).
8. Calculating the technical leveling log for linear structures.
9. Plotting the route (alignment) profile and calculating design-line elevations and working elevations.
10. Calculating the results of area (surface) leveling. Compiling the topographic plan of the area using the surface leveling results.
11. Compiling a tacheometric plan.
12. Representing relief and finalizing (formatting) the plan.

IV. Independent study and independent work.

The competence of independent learning helps students develop themselves independently and increases the effectiveness of their professional activity. Students carry out independent work on their own mobile devices, under the guidance of the instructor, either in traditional or electronic form.

Recommended topics for independent study:

1. Introduction. The subject and tasks of geodesy. Brief historical information. The role of geodesy in the development of the national economy of our country.
2. The concept of the shape and dimensions of the Earth.
3. The effect of Earth's curvature on distance measurement. Brief

	information on cartographic projections. 4. The projection method in geodesy. Coordinate systems. Spatial coordinates. 5. Coordinate system on a plane. Height (elevation) system. 6. Orientation of lines on the ground. True and magnetic azimuths, bearing (directional) angle and rhumb. The relationship between true and magnetic azimuths. 7. Direct and inverse geodetic problems. The relationship between the bearing angle and the interior angles of a traverse. 8. Scales and their accuracy. 9. The concept of plan, map and profile. Nomenclature of maps and plans. 10. Terrain relief and its representation on topographic maps and plans. 11. Problems solved using topographic maps and plans. 12. Determining areas by analytical and graphical methods. 13. Determining areas by the mechanical method. Determining areas using a planimeter. 14. Geodetic measurements and their accuracy. 15. The concept of measurement errors. 16. Measuring horizontal angles on the ground. The principle of horizontal angle measurement. Theodolites. 17. The main parts of theodolites. 18. Electronic and laser surveying instruments. 19. Methods of angle measurement. Checking and adjusting a theodolite. 20. Measuring the length of a line. 21. Measuring line length using a rangefinder. 22. Geodetic reference points (stations). 23. Interpretation (decoding) of remote-sensing data. 24. Determining the relative and absolute heights of points. 25. Leveling of a route (alignment). 26. Surface leveling. 27. GNSS and GPS receivers. 28. Modern levels (leveling instruments) and their classification. 29. Phototopographic surveys. Aerial phototopography. 30. Surveying works in the construction of buildings and structures.
Student assessment	Assessment of students' knowledge is based on indicators of mastery of the course material during the current, intermediate and final control periods (results of tests, assignments, written and oral work). During the course, students are assessed on a 100-point scale. Of these, 50 points are allocated to current and intermediate results (60% of the 50 points for current control and independent study, and 40% for intermediate control), and 50 points are allocated to the final control result. Students whose combined current and intermediate score is below 30 points are not admitted to the final control examination. A student who scores 30 or more points in the final control is considered to have mastered the course.
Examination requirements	The student must have fully mastered the theoretical and practical concepts of the topic and must be able to correctly present the results of analysis. The student must have completed the assignments given in independent work and in the current and intermediate forms of assessment. At the same time, within the established timeframe, the student must have obtained the required scores in the current, intermediate, independent-study and final controls for the

	relevant course. A student who has not submitted the assignments for current control, intermediate control and independent study, or who has scored fewer than 30 points for these assignments and types of control, is not admitted to the final control. Likewise, a student who misses 25% or more of the classroom hours allocated to this course without a valid excuse is removed from the course, is not admitted to the final examination, and is considered not to have earned the corresponding credits for the course. A student who fails the final examination, or who scores in the range of 0–29.9 points on this type of examination, is considered to have an academic debt (deficiency).
Recommended literature	**Core literature** 1. Xudaykulov N.J., Karabekov U.A. Injenerlik geodeziyasi. darslik. Jizzax. Ilm Nuri Print nashriyoti – 2024. - 242 b. 2. Xudaykulov N.J. Injenerlik geodeziyasi. Darslik. 2021 y. – 286 b. **Supplementary literature** 3. Karabayeva T.M., Oymatov R.Q., Ashiroy Y.R. Muhandislik geodeziyasi va topografik chizmachilik. O‘quv qo‘llanma – T., Sano-standart nashriyoti. 2019. - 336 b. 4. Inamov A.N., Lapasov J.O., Xikmatullayev S.I. Injenerlik geodeziyasi. O‘quv qo‘llanma. – T., 2017. – 200 b. 5. Schofield W., Breach M. Engineering surveying. Sixth edition, 2012 // www.books.elsevier.com **Information sources** 6. www.mc.uz 7. www.ziyonet.uz 8.https://tiss.tuwien.ac.at/course/courseDetails.xhtml?dswid=2188&dsrid=964&semester=2026W&courseNr=104616