Course name	**Engineering Geodesy (ECTS 4)**
Subject/module code	IGEOD1404
Science taught semester (s).	4th semester
Responsible teacher	Khudaykulov Nuridin Djanizakovich, Acting Associate Professor
Education language	Uzbek
Connection to the curriculum	Mandatory
Training hours (this including independent education)	**Total hours - 120.** **Contact (classroom) hours - 60.** Lecture hours - 24 Practical training hours - 24 **Independent study - 72 hours**
ECTS	4
The purpose and tasks of subject / learning outcomes	**The purpose of teaching science** to give students an understanding of the composition of the geodetic work carried out in the process of designing, constructing, and operating various engineering structures, the essence of the methods used, and to develop skills in applying geodetic instruments in practice. **The task of science is** to provide theoretical knowledge and practical skills; to establish scientifically grounded schemes and programs for efficient geodetic networks for the main types of engineering structures; to develop the most effective methods and instruments — based on the latest advances in science and technology — for carrying out surveys, setting-out, and alignment of engineering structures; and to generalize domestic and foreign experience accumulated in geodetic work on the construction of major engineering structures, teaching students to apply it in practice. **Learning outcomes:** 1. Be able to identify the most relevant and useful literature related to engineering geodesy. 2. Be able to analyze theoretical models and understand the underlying mechanisms. 3. Be able to gather data relevant to engineering-geodesy topics.
Course content (topics)	**I. Main theoretical part (Lectures)** Topic 1: General information about geodesy. Topic 2: Orientation of lines on the ground. The direct and inverse geodetic problems on a plane.

	Topic 3: Studying 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 in the field. Topic 7: Leveling and area determination. Topic 8: Modern geodetic instruments and their software. Topic 9: Geodetic control networks. Topic 10: Producing a topographic plan. Topic 11: Geodetic work in constructing the above-ground part of buildings and structures. Work performed during the zero (foundation) cycle of construction. Topic 12: Measuring deformations. **II. Guidelines and recommendations for practical training** The instructor's preparation for a practical lesson begins with studying the preliminary documents (curriculum, thematic plan, etc.) and concludes with drawing up a lesson plan. The instructor must have a clear understanding of the goals and objectives of the practical lesson and of the amount of work each student is expected to complete. The methodological guidelines are the instructor's main methodological document for preparing and conducting practical lessons. The purpose of practical training is to understand the theory and acquire skills — to apply them consciously 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 and plotting points by their coordinates. The projection method in geodesy. 2. Solving orientation problems (orienting lines on the ground, determining true and magnetic azimuths, magnetic declination, and convergence of meridians). 3. Scale. Types of scale. The scale of topographic maps and plans; small-scale geographic maps. 4. Studying conventional symbols on topographic maps. 5. Determining the slope angle or gradient of a given line between two points. 6. Studying the construction of theodolites. Computing the coordinates of a closed theodolite traverse. Computing the coordinates of an open theodolite traverse. 7. Compiling and finalizing a theodolite survey plan.

	8. Studying the construction of levels (leveling instruments). 9. Computing the technical leveling log (field book) for linear structures. 10. Plotting the route (alignment) profile and computing the design-line elevations and working elevations. 11. Computing the results of area leveling. Compiling a topographic plan of the area using the surface leveling results. 12. Compiling a tacheometric plan. Depicting relief and finalizing the plan. **III. Computational-graphical assignment** Computing the coordinates of theodolite traverse points. Compiling the plan of the theodolite survey. **IV. Independent study and independent work** Independent-study competence helps students develop themselves independently and increases the effectiveness of their professional activity. Students carry out independent work on their mobile devices under the instructor's guidance, in either traditional or electronic form. **Independent-study topics recommended for the above themes:** 1. Introduction. The subject and tasks of geodesy. A brief historical overview. The role of geodesy in the development of our country's national economy. 2. The concept of the shape and dimensions of the Earth. 3. The effect of the Earth's curvature on distance measurement. A brief overview of cartographic projections. 4. The projection method in geodesy. Coordinate systems. Spatial coordinates. 5. Plane coordinate systems. Height (elevation) systems. 6. Orienting lines on the ground. True and magnetic azimuths, bearing angle, and rhumb. The relationship between true and magnetic azimuths. 7. The 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 concepts of plan, map, and profile. The nomenclature of maps and plans. 10. The relief of an area and its depiction on topographic maps and plans. 11. Problems solved using topographic maps and plans. 12. Determining land areas by analytical and graphical methods. 13. Determining land areas by mechanical methods. Determining land areas with a planimeter. 14. Geodetic measurements and their accuracy.

	15. The concept of measurement errors. 16. Measuring horizontal angles in the field. The principle of horizontal angle measurement. Theodolites. 17. The main components of theodolites. 18. Electronic and laser geodetic instruments. 19. Methods of angle measurement. Checking and adjusting a theodolite. 20. Measuring line length. 21. Measuring line length with a rangefinder (tacheometer). 22. Subsidiary geodetic control networks. 23. Interpreting (decoding) remotely sensed data. 24. Determining the relative and absolute elevations of points. 25. Leveling a route (alignment). 26. Leveling an area (surface). 27. GNSS and GPS receivers. 28. Modern leveling instruments and their classification. 29. Phototopographic surveys. Aerial phototopography. 30. Geodetic work in the construction of buildings and structures.
Exam form	Written
Teaching/ learning and examination requirements	Students' knowledge is assessed based on how well they master the course material during the semester and the final assessment (results of tests, assignments, and written and oral work). Over the course of the semester, students are graded on a 100-point scale. Of this, 50 points are allocated to current and midterm performance (of which 60% is current control and independent study, and 40% is midterm control), and 50 points are allocated to the final control result. Students whose combined current and midterm score is below 30 points are not admitted to the final examination. A student who scores 30 points or more on the final control is considered to have mastered the course.
Scope of assessment criteria and procedure	Students must have fully mastered the theoretical and practical concepts of the topic and must be able to correctly present the results of their analysis. Students must have completed the assignments given for independent work and for current and midterm assessment. In addition, within the set time frame, students must have earned the required number of points in the current, midterm, independent-study, and final controls for the course. Students who have not submitted current-control, midterm-control, or independent-study assignments, or who have scored fewer than 30 points on these assignments and control types, are not admitted to the final control.

	In addition, a student who misses 25% or more of the classroom hours allotted to the course without valid excuse is removed from the course, is not admitted to the final examination, and is deemed not to have earned the corresponding credits for the course. A student who fails to pass the final examination, or who scores in the range of "0–29.9" on it, is considered to have an academic debt.
Criteria for assessing student knowledge	

5 grade	100 points		Assessment criteria
5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.
3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.

Course assessment criteria and procedure

Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
		Student activity (in	10 points	

		seminars, practical, laboratory classes)		
Midterm assessment	20 points	Supervision: Written work	10 points	12 points
		System tasks	10 points (divided by the number of tasks)	
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				

Recommended literature

Core literature

1. Khudaykulov N.J., Karabekov U.A. Engineering Geodesy (textbook). Jizzakh: Ilm Nuri Print Publishing House, 2024. – 242 p.

2. Khudaykulov N.J. Engineering Geodesy (textbook). 2021. – 286 p.

Additional literature

3. Karabayeva T.M., Oymatov R.Q., Ashirov Y.R. Engineering Geodesy and Topographic Drafting (study guide). Tashkent: Sano-Standart Publishing House, 2019. – 336 p.

4. Inamov A.N., Lapasov J.O., Khikmatullayev S.I. Engineering Geodesy (study guide). Tashkent, 2017. – 200 p.

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. http://www.geokniga.org/bookfiles/geokniga-geodeziya-popov-vn-chekalin-vi-

9. https://tiss.tuwien.ac.at/course/courseDetails.xhtml?dswid=2188&dsrid=964&s