REPUBLIC OF UZBEKISTAN

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS

FERGANA STATE TECHNICAL UNIVERSITY

Engineering Geodesy

MODULE HANDBOOK

Field of study:	700000 – Engineering, processing, and construction fields
Field of education:	730000 - Architecture and Construction
Education program:	60730300 – Civil Engineering

Fergana 2025

Module title	*Engineering Geodesy*
Code (if available)	*EGT34*
Semester(s) of module teaching	*3*
Responsible for the module	*Qosimov Lazizbek Muxsinjon o'g'li* *Associate Professor of the Department of Geodesy, Cartography, and Cadastre*
Language of instruction	*Uzbek*
Connection to the curriculum	*Elective*
Teaching methods	*Lecture, practical session, independent study.*
Study load (including classroom and independent study hours)	*Total hours: 120 hours* *Auditorium hours: 48 hours* *Lecture – 16 hours, Practical session – 32 hours, Independent study – 72 hours*
Credit units	*4*
Required and recommended prior knowledge for studying the module	*Mathematics, Remote Sensing and Photogrammetry, Automated Design Systems in the Field of Cadastre*
Module objectives/intended learning outcomes	***Module Objective:*** *The aim of this course is to provide students with knowledge and skills relevant to their area of specialization in conducting high-precision geodetic measurements. This includes understanding the structure, operating principles, testing, adjustment, and application of geodetic instruments; selecting appropriate instruments and measurement methods for specific conditions; calculating and evaluating measurement results; identifying and correcting errors in geodetic measurements; establishing geodetic control networks and detail survey networks; creating large-scale topographic plans; and applying geodetic instruments in practice.* *During the course, students will also become familiar with the laws adopted in this field at the national, regional, provincial, and local (district/city) levels of the Republic. They will learn to develop and analyze related information based on modern technologies and evaluate legal frameworks in practice.* *By the end of the course, students should possess the following knowledge and skills:* *- General information about the Earth's shape, dimensions, and gravitational field, as well as knowledge of geodetic and astronomical coordinate systems and reduction problems;* *- Principles and methods of establishing national horizontal and vertical geodetic networks; skills in conducting high-precision angular measurements, high-precision leveling, identifying sources of measurement errors and minimizing them, and adjusting measurement results;* *- Proficiency in the structure and operation of modern geodetic instruments currently being developed and used in practice, including skills in their effective use for precise geodetic work, as well as testing, researching, and adjusting these instruments.*
Content	*Module 1. Introduction to Geodesy* *The science of geodesy and its objectives. The role of geodesy in the national economy and defense. A brief history of the*

	development of geodesy. *Module 2. Topographic Maps and Plans* *Shape and size of the Earth. Geoid and the Earth's ellipsoid. Projection methods in geodesy. Parameters required for geodetic projection. Influence of Earth's surface curvature on horizontal distances.* *Module 3. Determining Elevation of Ground Points* *Spatial: geographic and geodetic coordinate systems, planar (flat) coordinate systems. Elevations of ground points. International coordinate and elevation systems. Geodetic orientation. Orientation angle. True meridian, Prime meridian, Central meridian. True azimuth. Forward and backward azimuths.* *Module 4. Principles of Angle Measurement* *Angle measurement: horizontal and vertical angles. Determining line lengths using scales. Calculating areas on contour plans using scales.* *Module 5. Geodetic Control Networks* *Geodetic control networks: first-order, second-order, third-order, and fourth-order geodetic networks. Methods of establishing networks and their significance.* *Module 6. Topographic Surveying* *Optical theodolite. Technical theodolite. Limb, alidade, vernier, sighting tube, circular and cylindrical levels, rack and pinion, microscope, base plate, reticle, bisector. First, second, and third instrument check conditions.* *Module 7. Understanding and Checking the Theodolite* *Structure of a level. Circular level. Objective lens. Elevation screws. Line of sight. Base plate. Leveling rods. Checking and adjusting levels. Types of leveling: geometric, surface, hydrostatic, barometric, mechanical, and trigonometric.* *Module 8. Working with the Theodolite* *Technical theodolite. Limb, alidade, vernier, sighting tube, circular and cylindrical levels, rack and pinion, microscope, base plate, reticle, bisector. Instrument checking procedures.* *Module 9. Understanding and Using Scales* *Scales, types of scales, the meaning of scale, using scales in mapping, small scale, medium scale, large scale.* *Module 10. Depiction of Terrain Relief on Maps and Plans* *Relief, terrain, types of relief, representing relief on topographic maps and plans, contour lines, base contours, cliffs, hills, contours.* *Module 11. Understanding and Checking the Leveling Instrument* *Structure of a level. Circular level. Objective lens. Elevation screws. Line of sight. Base plate. Leveling rods. Checking and adjusting levels. Types of leveling: geometric, surface, route, hydrostatic, barometric, mechanical, and trigonometric.* *Module 12. Working with the Level* *Structure of a level. Circular level. Objective lens. Elevation screws. Line of sight. Base plate. Leveling rods. Checking and adjusting levels. Geometric leveling. Surface leveling. Route leveling.* *Module 13. Modern Geodetic Instruments and Their Use* *Modern instruments, their applications, and testing.*

	Module 14. Electronic Total Stations and Their Use *Electronic total station, preparing the total station for operation, measuring distances and horizontal/vertical angles with a total station.* *Module 15. GPS Devices and Their Use* *Global Positioning System devices, navigators, measuring distances and angles using GPS.*
Forms of assessment	*Oral assessments, presentations, written works, practical assignments, and final exams.*
Requirements for study and assessment	*To successfully complete the module, the student must attend classes and obtain the minimum required scores in current, midterm, and final assessments.*
Bibliography	*1.Muborakov H., Oxunov Z.D. Geodesy. Parts I–II. Tashkent: Spectrium Media Group, 2021.* *2. Qodirov A.G‘. Geodesy 1. Tashkent: Sano-Standard, 2018.* *3. Xoshjanova K. Geology, Mineralogy and Geodesy. Tashkent: Innovatsiya-Ziyo, 2020.* *4. Avchiyev Sh.K. Applied Geodesy. Tashkent: Voris, 2010.* *5. Vermeer M. Geodesy: The Science Underneath. Helsinki: Science Technology, 2019.* *6. Avchiyev Sh.K. Construction and Engineering Geodesy. Tashkent: Voris, 2018.*
Reviewers	*B.M. Akhmedov – Senior Lecturer at the Department of Geodesy, Engineering Geodesy, and Cadastre, Fergana State Technical University.*