



**NICOPA:
NEW AND INNOVATIVE COURSES
FOR PRECISION AGRICULTURE**



**TITLE OF THE
Curricula/Module**

**MODERN GEODETIC
EQUIPMENT
(TEXTBOOK)**

TIAME/Uzbekistan

March, 2020

Template of the Curriculum/Module Description

Short Name of the University/Country code Date (Month/Year)	TIAME/UZ 03/2020
TITLE OF THE Curricula/Module	Code
Modern geodetic equipment (Textbook)	

Teacher(s)	Department
Coordinating: Aziz Inamov Others: Sarvar Toshpulatov Utkir Islomov Anvar Pardaboev	Department of Geodesy and Geoinformatics

Study cycle	Level of the module	Type of the module
<u>BA</u> /MA/PhD	Bachelor's degree	

Form of delivery	Duration	Langage(s)
offline	18 weeks	uzbek

Prerequisites	
Prerequisites: To know: Geodesy; Cartography; Possess: Basics of GIS	Co-requisites (if necessary):

ECTS (Credits of the module)	Total student work load hours	Contact hours	Individual work hours
5	152	90	62

Aim of the module (course unit): competences foreseen by the study program
This course describes the design and operation of electronic total stations, digital levels, surface laser scanners and UAVs. It also describes the antennas used in satellite navigation systems and satellite surveying equipment.

Learning outcomes of module (course unit)	Teaching/learning methods	Assessment methods
<p>Study devices: Laser measurer, total station, digital levels, laser scanner, GPS, GNSS, Drone</p> <p>To point: • use of electronic geodetic instruments;</p> <p>To explain: Use in the field of the essence of all digital geodetic constructions;</p> <p>To numerate: • Processing and analysis of field research in the program;</p> <p>To recognize: • The importance of the field of geodesy in agriculture and other areas;</p> <p>To give examples of: • Examples of applications: resource mapping using digital geodetic instruments, surface and underground surveys, monitoring of land changes, modern methods of accounting of forestry, water management and agricultural facilities;</p> <p>To describe: • how to perform basic processing tasks in practical work using modern technical means;</p> <p>To formulate: • Reconstruction of the site, the formation of the object sketch, database installation, data collection, processing, analysis, observation, forecasting.</p>	<p>Practical and theoretical assignments</p>	<p>Test and creative</p>
<p>To be able to:</p> <ul style="list-style-type: none"> • Collect information about the research object; • Study of state geodetic networks; • Exploring the area and drawing an outline; • Export of field research results to applications, integration of data from geodetic devices, data alignment (reduction and centralization errors), creation of topographic plan of the area, linking to the coordinate system, spatial analysis and construction of three-dimensional model; • Evaluate existing theories and technologies and identify the need for improvement 	<p>Implementation of the training project</p>	<p>Presentation of an educational project</p>
<p>Possess:</p> <ul style="list-style-type: none"> • Creating a digital topographic map of the earth on the basis of modern research; • Analysis of the obtained data; • Classification by controlled and uncontrolled and object-based classification methods. 	<p>Implementation of the training project</p>	<p>Presentation of an educational project</p>

• Describe geometric and atmospheric correlations		
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Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
The purpose, tasks and essence of the science of modern geodetic instruments	4	0	0	6	0	0	10	6	Compensation for the effect of the vertical axis slope of electronic tachometers on the accuracy of angle and direction measurements.
Total stations and their history	4	0	0	6	0	0	10	7	Analysis of the effect of instrument errors on the raster systems of counting directions on the Ta3M taximeter using computer modeling
Topographic survey by using Leica TS Total Station	4	0	0	6	0	0	10	7	Topographic survey on Leica TS 06+ electronic taximeter
Digital levels and their classification	4	0	0	6	0	0	10	7	Design and numerical principle of digital levels of Leica Geosystems AG Design and numerical principle of Trimble digital

									levels The principle of counting on the rails introduced in the levels of the firm Topcon
The design and truncation principle of Trimble's digital levels	4	0	0	6	0	0	10	7	Barcode rails and their inspection
Study of "Level-barcode-rail" student systems	4	0	0	6	0	0	10	7	Shooting on Trimble DINI 07 digital levels
Satellite geodetic instruments and their classification, GPS / GLONASS software support	4	0	0	6	0	0	10	7	Sputnik Receivers, Antennas, Radio Frequency Block, Surveillance System, Measurement by Codes Counting of farm lands using GPS equipment Advantages of GNSS satellite receivers over GPS satellite receivers. Analysis of the effectiveness of global navigation satellite systems
Laser scanners and their types	4	0	0	6	0	0	10	7	Methods for measuring angular magnitudes in laser scans performed from the ground TX-5 and TX-8 laser scanners

Remote sensing against field study researchers, Ability to shoot with the help of Phantom 4 Pro	4	0	0	6	0	0	10	7	Commissioning and launch of the Phantom 4 Pro drone Phantom 4 Pro drone data three-dimensional data
Total	36	0	0	54	0	0	90	62	152

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Running control 1	35	8 week	preliminary presentation of the project
Running control 2	35	14 week	Presentation of an educational project
Final exam	30	18 week	Final quiz

Compulsory literature/Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Tashpulatov S.A., Nazarov B.R., Shavkatova N.J.	2019	Modern geodetic instruments	УДК 528.5	Tashkent, Teacher's Publishing House T.: 2000
Schauerte W., Michel C., Tullman U.	2005	Neue Einsatzgebiete für Digitalnivele aufzeigt am Beispiel des Zeiss DiNi	VR 61/2	
Ingensand H., Maurer W., Schauerte W.	2002	Die Digitalnivellierfamilie WILD	NA2002/NA3000 und ihre Anwendungen in der Ingenieurvermessung	Beiträge zum XI. Internationalen Kurs für Ingenieurvermessung
Grimm K., Frank P., Giger K.	2002	Distanzmessung nach dem Laufzeitmessverfahren mit geodatischer Genauigkeit		ild Heerbrugg AG, CH-9435 Heerbrugg (Schweiz)

Additional literature				
Feist W., Donath B., Go'ring H., Ko'hler M., Seeber M., Monz L.	2002	Elta S10 und Elta S20 von Carl Zeiss,		Systemtachymeter einer neuen Generation
Prusky J.	2001	The Cooperative CORS Program	Vol. 21, No. 1.	Professional surveyor
Snay R.A.	2000	Modern terrestrial reference systems	Vol. 19, No. 10.	Professional surveyor

ANOTATION /course summery

This textbook describes the principles of construction and operation of modern laser measurers, total stations and digital levels, methods of their research and verification. The errors of digital geodetic instruments have been analyzed and great attention has been paid to ways to reduce their impact. The antennas used in the Satellite navigation system, time saving in satellite technology, satellite geodetic devices, classification of terrestrial laser scanners, scanning errors of scanners, their effects on atmospheric scanning are described.

List of themes and short description

Themes	Contact work hours
The purpose, tasks and essence of the science of modern geodetic instruments Provides students with theoretical knowledge, practical skills, skills in the use of geodetic equipment and tools, as well as the formation of a scientific worldview.	10
Total Stations and their history Current total stations, areas of application, technical characteristics and prospects of use are given.	10
Topographic survey by using Leica TS Total Station Conducting field research and electronic topographic plan of the place by using Total Station brand Leica TS	10
Digital levels and their classification Types, uses and applications of digital levels	10
The design and truncation principle of Trimble's digital levels Trimble's classification of digital levels, barcode racks, counting principles and data processing programs	10

<p>Study of "Level-barcode-rail" student systems</p> <p>Types, classification, bar coding principle and the essence of bar coding</p>	<p>10</p>
<p>Satellite geodetic instruments and their classification, GPS / GLONASS software support</p> <p>Satellite geodetic networks, methods of their construction, geodetic satellite devices used in their construction</p>	<p>10</p>
<p>Laser scanners and their types</p> <p>Types, classification, areas of application and principle of operation of surface laser scanners</p>	<p>10</p>
<p>Remote sensing against field study researchers, Ability to shoot with the help of Phantom 4 Pro</p> <p>Types, classification, areas of application and research methods of remote control devices</p>	<p>10</p>