



TITLE OF THE Curricula/Module

PHOTOGRAMMETRY AND REMOTE SENSING

TOHU /Turkmenistan

Explanation record of subject / module

Name of higher educational institution / country code Date (month/year)	TOHU-TKM 2021
Name of subject / module	Code
Photogrammetry and remote sensing – 4 ECTS; 32 general theoretical; 64 practical lessons;	

Lecturers	Department
Prepared by: Lecturer Shadurdyev Govshut	Land resources

Field of study	Level of subject	Kind of subject
BA/MA/PhD	Specialist	

Kind of education mode	Duration	Language
Full time	18 weeks	Turkmen

Required conditions	
<p style="text-align: center;">Required conditions:</p> <p>Knowledge of: Higher mathematics, engineering and computer graphics, modern computer technology, geodesy</p> <p>Skills: Be able to manage ArcGIS, QGIS, MapGIS software</p>	<p style="text-align: center;">Other requirements (if necessary):</p>

ECTS (module credits)	Total working hours of students	Total lessons	Practical lessons	Student independent work
4	160	48	64	48

Course objective (module): Skills provided by the curriculum
Objectives of photogrammetry and remote sensing course: To improve the efficiency of the use of land resources in our country, to carry out and organize photogrammetry and remote sensing, to make changes to plans and maps, to determine the location of the aerial photographs, to teach students how to make changes to plans in more widely used ways.

Tasks of subject	Methods of teaching	Methods of evaluation
<i>Knowledge of:</i> – Concepts of photogrammetry and remote sensing;	General trainings, presentations, seminars, practical	Term paper, software management, test questions, summaries, credits, test

<ul style="list-style-type: none"> – General information about satellite imaging systems; – Photogrammetry and remote sensing as the basics of data organization; – General features of basic models for displaying spatial information in photogrammetry and remote sensing. 	<p>trainings, independent work</p>	
<p><i>Skills:</i></p> <ul style="list-style-type: none"> – Decipher images; – Development of remote sensing data; – Performing geographic data processing and analysis using geoinformation systems. 		<p>Curriculum implementation presentation</p>
<p><i>Capacity of:</i></p> <ul style="list-style-type: none"> – Data processing to calculate information about soil or vegetation. 		<p>Curriculum implementation presentation</p>

Topics	Work hours							Time and issues for individual work	
	General	Consultations	Seminars	Training	Practical	Educational	Total work	Student independent	Assignments (examples)
Photogrammetry and remote sensing systems	2							2	
Physical basis of remote sensing	2							2	
Active and passive methods of photography	2							2	
Characteristics of scanners and satellite platforms	2							2	
Space images	2							2	
Processing of remote sensing data	2							2	
Geometric transformation of images	2							2	
Coordinate modification and re-discretization	2							2	
Images deciphering	2							2	
Automated deciphering	2							2	
Uncontrolled grouping algorithms	2							2	
Controlled grouping algorithms	2							2	
Using vegetation indices	2							2	
Data processing for calculating vegetation information	2							2	
Data processing for calculating soil information	2							2	
Global Navigation Satellite Systems (GNSS)	2							2	
Total	32							32	
Method of evaluation	Total mark %	Test periods					Evaluation criteria		
1 st midterm	10	4 th week					Computerized test examination		
2 nd midterm	15	8 th week					Computerized test examination		
3 rd midterm	15	13 th week					Computerized test examination		

4 th midterm	10	17 th week	Term paper defence	
Final examination	50	20-21 st week	Final examination	
Author	Year of publication	Name	Publ. №	Place of publication, printing house or internet web-site
Main references				
Gurbanguly Berdimuhamedov	2015	Towards new heights of development. Selected works. Volume 8		Ashgabat: Turkmen state publishing house
	2019	Program of social economic development of the President of Turkmenistan for 2019-2025		Ashgabat: Turkmen state publishing house
	2016	Source of wisdom		Ashgabat: Turkmen state publishing house
	2019	Education, science, healthcare, sports and archives development program in Turkmenistan for 2019-2025		Ashgabat: Turkmen state publishing house
Soltanov S.	2009	Geoinformation systems. Guide book for higher education institutions		Ashgabat: TDKP
Allakov M.	2010	Geography based on topography. Textbook for higher education institutions		Ashgabat: Ylym
Guryanova L.V.	2009	Introduction to Geographic Information Systems: A Handbook for Geography Students		Minsk: BSU
Guryanova L.V.	2003	GIS hardware and software: course of lectures		Minsk: BSU
Svidzinskaya D.V., Bruy A.S.	2014	QGIS Basics		Kiev
Additional references				
Kapralov Ye.G., Koshkarev A.V.,	2004	Fundamentals of Geoinformatics.		Moscow: Academy

Tikunov V.S. and others		Textbook for university students in 2 books		
Kovin V., Markov N.G.	2008	Geographic information systems: a tutorial.		Tomsk: Publishing House of Tomsk Polytechnic University
Kurlovich D.M.	2013	Geoinformation methods of analysis and forecasting of weather: teaching aid		Minsk: BSU
1. www.turkmenistan.gov.tm 2. www.nicopa.eu 3. www.qgis.org 4. www.qgistutorials.com 5. www.gisinfo.ru 6. www.maps.google.ru				

Summary / Course short description

Remote sensing is a method of obtaining information about an object or event by analyzing the information it collects without touching the object being studied.

The latest advances in science and technology that have come to Earth science in recent decades have had a significant impact on the development of remote sensing.

The most influential are:

- development of space technology and technologies used for the needs of geodetic navigation of satellite navigation systems;
- development of electronic computing, including the emergence of powerful personal computers;
- development of microelectronics and development of new types of sensors capable of recording electromagnetic radiation with high geometric and radiometric parameters;
- development of laser and optical-electronic techniques, various objects, including radio-technical methods of long-distance surface study.

In the modern phase, new problems are being solved with the help of remote sensing devices: the creation of geo-information technologies, algorithms and programs for deciphering images, and so on.

List and summary of topics

Serial number of general lesson	Topics and their content	Q-ty of hours
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	Introduction	
1	Photogrammetry and remote sensing systems Concept of remote sensing. Phases of remote sensing and data analysis. Photo Map Technology ERDAS IMAGINE 2010 software package. Range of use of remote sensing data.	2
2	Physical basis of remote sensing Electromagnetic spectrum and its characteristics. Interaction of radiation with the atmosphere. Features of the spectral characteristics of objects.	2
3	Active and passive methods of photography General information about satellite imaging systems. Passive photography systems. Scanner characteristics and their relationship to the size of the map. Active photography systems.	2
4	Characteristics of scanners and satellite platforms Characteristics of scanners. Characterization of satellite platforms. Remote sensing data.	2
5	Space images Thematic and continuous raster layers. Digital data recording formats. Structure of the img-file data types. Save img-files.	2
6	Processing of remote sensing data Stages of pre-processing digital images. Basic concepts. Characteristics of the image processing stages.	2
7	Geometric transformation of images Concepts of geometric transformation. Choosing a mathematical model of transformation. Calculation of the parameters of the transformation model.	2
8	Coordinate modification and re-discretization Changing coordinates. Reproductive discrimination methods. Assessing transformation errors.	2
9	Images deciphering Visual methods of deciphering. A direct deciphering method. Indication method of deciphering.	2
10	Automated deciphering Automated methods of deciphering. Ways to group photos by machine. Process of implementing machine grouping.	2
11	Uncontrolled grouping algorithms Basic concepts of cluster analysis. ISODATA clustering algorithm.	2
12	Controlled grouping algorithms	2

	Teaching options and signatures. Non-parametric determining rules. Parametric determining rules. Assessing the quality of the taught options.	
13	Using vegetation indices Operations with pixels and vegetation indices. Earth drawing. Calculation of vegetation indices.	2
14	Data processing for calculating vegetation information Classification of the type of crops. Crop condition assessment (crop monitoring, damage assessment). Yield assessment.	2
15	Data processing for calculating soil information Display of soil characteristics. Display of soil type. Soil erosion. Soil moisture. Display of tillage practice.	2
16	Global Navigation Satellite Systems (GNSS) GNSS technologies. GNSS receivers for satellite navigation systems. Binding coordinates to taken photos.	2
Total:		32