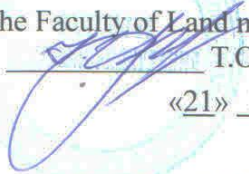


NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF  
UKRAINE

Department of Geoinformatics and Aerospace Research of the Earth

**"CONFIRMED"**

Dean of the Faculty of Land management

  
T.O. Ievsiukov

«21» May 2024

**"APPROVED"**

at the meeting of the department of Geoinformatics and Aerospace  
Research of the Earth

Protocol № 12 from «16» May 2024


Acting head of Department

  
A.A. Moskalenko

**"REVIEWED"**

Program Coordinator

Geodesy and Land Management

  
I.P. Kovalchuk.

**PROGRAM OF THE COURSE**

**REMOTE SENSING FOR LAND RESOURCES MONITORING**

Branch of knowledge	of	19. Architecture and construction
Specialization		193. Geodesy and Land management
Educational program		"Geodesy and Land Management"
Faculty		Land Management
Developers		Associate prof., PhD, Moskalenko A.A.
		Denysiuk B.I.

## Description of the course

### “Remote sensing for land resources monitoring”

Field of knowledge, specialization, educational program, educational degree		
Educational degree	<i>Bachelor's</i>	
Specialization	<i>193 Geodesy and Land management</i>	
Educational program	<i>Geodesy and Land management</i>	
Description of the course		
Type	Compulsory	
Total number of hours	120	
Number of ECTS credits	4	
Number of content modules	2	
Course project (work) (if applicable)		
Form of assessment	<i>Credit</i>	
Indicators of the course for full-time and part-time forms of study		
	Full-time form of study	Part-time form of study
Course (year of study)	<i>4</i>	-
Semester	<i>7</i>	-
Lecture classes	<i>15 hr.</i>	-
Practical, seminar classes	-	-
Laboratory classes	<i>30 hr.</i>	-
Self-study	<i>75 hr.</i>	-
Number of weekly classroom hours for the full-time form of study	<i>3 hr.</i>	

#### 1. Purpose, objectives, and competencies of the course

**Purpose:** To learn the concepts of remote sensing and to get practical skills of previous and thematic geoprocessing to be used in land management and cadaster.

##### **Objectives:**

- to learn main theoretical concepts of remote sensing and receiving remote sensing data;
- to learn general characteristics of optical sensors;
- to get skills of using methods of digital image processing.

As a result, learning of educational discipline “Remote sensing for land resources monitoring“ student needs to:

##### **KNOW**

- tasks, which are solved with the use of remote sensing data;
- ways to get remote sensing data;
- technology of acquisition and processing of remote sensing data

##### **BE ABLE**

- to identify classes of objectives based on visual features with the use of multispectral satellite imagery of high and medium spatial resolution;
- to create spectral signatures based on remote sensing data;
- to make application for surveying and obtaining information based on satellite imagery and UAV’s images;

- to use software for processing of remote sensing data to solve current tasks of land management and monitoring of land resources;

#### TO BE AWARE OF

- perspective researches in remote sensing;
- using remote sensing data in land management.

#### ***Acquisition of competencies:***

##### **General competencies (GC):**

- GK 01. Ability to learn and master modern knowledge.
- GK 02. Ability to apply knowledge in practical situations.
- GK 05. Ability to communicate in a foreign language.
- GK 06. Ability to use information and communication technologies.
- GK 07. Ability to work autonomously.
- GK 08. Ability to work in a team.
- GK 10. Ability to exercise safe activity.
- GK 11. Ability to carry out geodetic monitoring of the earth's surface, natural objects, engineering structures.
- GK 12. The ability to exercise their rights and responsibilities as a member of society; awareness values of civil (free democratic) society and its necessity sustainable development, the rule of law, rights and human and civil liberties in Ukraine.
- GK 13. Ability to preserve, multiply moral, cultural, scientific values and achievements of society based on understanding of history, patterns of development of the subject area, its place in the general system of knowledge about nature and society, as well as in the development of society, technology and technology. activities for recreation and healthy living

##### **Professional (special) competencies (PC):**

- SC 01. Ability to apply fundamental knowledge to analyze phenomena of natural and man-made origin in the performance of professional tasks in the field of geodesy and land management.
- SC 03. Ability to apply regulations, regulatory and technical documents, reference materials in professional activities.
- SC 04. Ability to choose and use effective methods, technologies and equipment for professional activities in the field of geodesy and land management.
- SC 05. Ability to use modern information, technical and technological support to address complex issues of geodesy and land management.
- SC 06. Ability to perform remote, ground, field and in-house research, engineering calculations for processing research results, prepare research results, prepare reports in solving problems of geodesy and land management.
- SC 07. Ability to collect, update, process, critically evaluate, interpret, store, publish and use geospatial data and metadata on objects of natural and man-made origin.
- SC 08. Ability to carry out professional activities in the field of geodesy and land management, taking into account the requirements of professional and civil safety, labor protection, social, environmental, ethical, economic aspects.
- SC 09. Ability to use tools, instruments, equipment, facilities in the performance of geodetic and land management tasks.
- SC 10. Ability to monitor and evaluate land.

SC 12. Ability to conduct technical control and assess the quality of topographic, geodetic and cartographic products.

SC 13. Ability to develop documentation on land management and land valuation, cadastral documentation, fill in the data of state land, urban and other cadastres

**Program learning outcomes (PLO):**

LR 1. Fluent in oral and written forms in state and foreign languages on professional matters.

LR 2. Organize and manage the professional development of individuals and groups.

LR 3. Communicate information, ideas, problems, solutions, personal experience and arguments to specialists and non-specialists.

LR 4. To know and apply in professional activity normative-legal acts, normative-technical documents, reference materials in the field of geodesy and land management and related branches.

LR 7. Perform surveys and survey, topographic and geodetic, cartographic, design and design and survey work in the performance of professional tasks in geodesy and land management.

LR 9. Collect, evaluate, interpret and use geospatial data, metadata on objects of natural and man-made origin, apply statistical methods of their analysis to solve specialized problems in the field of geodesy and land management.

LR 10. Choose and apply tools hardware, hardware and software supplies needed for remote, ground, field and in-house research in in the field of geodesy and land management.

LR 11. Organize and execute remote, ground, field and camera works in the field of geodesy and land management, draw up the results of work, prepare relevant reports.

LR 12. Develop documentation from land management, cadastral documentation and land valuation documentation with application computer technology, geoinformation systems and digital photogrammetry, to fill the state land with data, urban and other cadasters.

LR 13. Plan and execute geodetic, topographic and cadastral surveys, process the results in geographic information systems.

LR 15. Develop and adopt effective decisions on professional activities in the field geodesy and land management, including under conditions uncertainty.

## 2. Program and structure of the course for:

- complete full-time (part-time) form of study;
- shortened full-time (part-time) form of study.

Names of content modules and topics	Number of hours													
	Full-time form							Part-time form						
	weeks	total	including					total	including					
			1	p	lab	ind	self		1	p	lab	ind	self	
2	3	4	5	6	7	8	9	10	11	12	13	14		
<b>Content Module 1. Concept of remote sensing</b>														
Topic 1. Introduction. Concepts of remote sensing of the Earth. Electromagnetic radiation.	1-4	20	2		8		10							
Topic 2. Visual interpretation of objects.	5-6	16	2		4		10							
Topic 3. Classification of methods of remote sensing. Sensor systems.	7	12	2				10							
Topic 4. Image acquisition. Data formats. Standards in remote sensing.	8	12	2		3		7							
<b>Total for content module 1</b>	<b>60</b>		<b>8</b>		<b>15</b>		<b>37</b>							
<b>Content Module 2. Digital image analysis</b>														
Topic 1. Preprocessing of remotely sensed data.	9-10	5	2		3									
Topic 2. Image georeferencing and image transformation	10	13	1		2		10							
Topic 3. Image acquisition based on Unmanned Aerial Vehicles (UAVs).	11-12	12	2				10							
Topic 4. Image classification	13-15	28	2		8		18							
<b>Total for content module 2</b>	<b>60</b>		<b>7</b>		<b>15</b>		<b>38</b>							
<b>Total hours</b>	<b>120</b>		<b>15</b>		<b>30</b>		<b>75</b>							

## 3. Laboratory lessons

№	Topic title	Number of hours
1.	Visual interpretation of image elements in various spectral channels. Interpretation of recognized objects.	8
2.	Measurement of spectral brightness of objects	4
3.	Radiometric image enhancement	3

4.	Image resampling	2
5.	Unsupervised classification	3
6	Training sites. Signature comparison chart.	3
7	The quality of training sites. Application of algorithms of image classification based on hard rules	7
	<b>Total</b>	<b>30</b>

#### 4. Independent work topics

№	Topic title	Number of hours
1.	Professional terminology in remote sensing of the Earth	10
2	Image interpretation	10
3.	Remote sensing data acquisition	10
4.	Image georeferencing and image transformation	7
5	Preprocessing of remotely sensed data	10
6	Image acquisition based on Unmanned Aerial Vehicles (UAVs)	10
7	Image classification	18
	<b>Total</b>	<b>75</b>

#### 5. Means of diagnosing learning outcomes:

- exam;
- module tests;
- essays;
- defence of laboratory work.

#### 6. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- practical method (laboratory, practical classes);
- visual method (illustration method, demonstration method);
- work with educational and methodical literature (summarizing, summarizing, annotating, reviewing, writing an abstract);
- video method (remote, multimedia, web-oriented, etc.);
- independent work (task performance).

#### 7. Evaluation methods.

- exam;
- oral or written survey;
- modular testing;
- abstracts, essays;
- defence of laboratory works;
- presentations and speeches at scientific events.

8. **Distribution of points received** by students of higher education. The assessment of the knowledge of a higher education student takes place on a 100-point scale and is translated into national assessments according to the table. 1 of the current "Regulations on examinations and assessments at NUBiP of Ukraine"

Student rating, points	National grade based on exam results
90-100	Excellent
74-89	Good
60-73	Satisfactory
0-59	Unsatisfactory

In order to determine the rating of a student (listener) in the discipline  $R_{dis}$  (up to 100 points), the rating from the exam  $R_{ex}$  (up to 30 points) is added to the rating of a student's academic work  $R_{aw}$  (up to 70 points):  $R_{dis} = R_{aw} + R_{ex}$ .

### 9. Educational and methodological support

- electronic educational course of the educational discipline (on the educational portal of NUBiP of Ukraine eLearn - <https://elearn.nubip.edu.ua/course/view.php?id=1717>);

- abstracts of lectures and their presentations (in electronic form - <https://elearn.nubip.edu.ua/course/view.php?id=1717>);

- textbooks, training aids, workshops;

- methodical materials on the study of the academic discipline for students of higher education full-time and part-time forms of higher education

- ✓ Kokhan S.S., Vostokov A.B. Remote Sensing Land Resources Monitoring. Manual for bachelor students of the direction of training "Geodesy, cartography and land management". –K: Komprint.–2014.–303 p.

### 10. Recommended sources of information

#### Basic:

1. Кохан С.С., Востоков А.Б. Методи ДЗЗ. Навчальний посібник. К. ЦП Компринт. 2021. 286 с.
2. Зацерковний В.І. Дистанційне зондування Землі. Фізичні основи. Ніжин : НДУ ім. М. Гоголя, 2018. – 380 с.
3. Kokhan S.S. Vegetation Indices [Monograph] / S.S. Kokhan. – К. : «Komprint», 2015. –231 p.

#### Addition:

4. ISO 19101:2002 «Geographic information - Reference model»
5. Тарасова В. В. Екологічна стандартизація і нормування: Навчальний посібник/ В. В. Тарасова, А. С. Малиновський, М. Ф. Рибак. – К.: Ніка-Центр – 2007. – 276 с.
6. ISO/TS 19103:2005 «Geographic information - Conceptual schema language».
7. ISO/TS 19104:2008 «Geographic information – Terminology».
8. ISO 19107:2003 «Geographic information - Spatial schema».
9. ISO 19108:2002 «Geographic information - Temporal schema»
10. ISO 19110:2005 «Geographic information - Methodology for feature cataloguing»
11. ISO 19115 «Geographic information - Metadata»
12. ISO 19152:2012 «Geographic information - Land Administration Domain Model (LADM)»
13. ГІС-Асоціація України (назва з екрану). Режим доступу: <http://gisa.org.ua/>
14. GPSworld (назва з екрану). Режим доступу: <https://www.gpsworld.com/>
15. Open Source GIS History - OSGeo Wiki Editors". Retrieved 2009-03-21.
16. Steiniger and Bocher. Archived from the original on 2012-11-12. Retrieved 2011-08-05.

17. The MapWindow Project - Home. [www.mapwindow.org](http://www.mapwindow.org). Retrieved 2019-09-23.
18. Smith, Susan. Conform for real time 3D visualization. [www.giscafe.com](http://www.giscafe.com). GIS Cafe. Retrieved 24 February 2015.
19. Mapbox. Mapbox. Retrieved 2019-09-23.

"APPROVED"  
Academic Council of the Faculty of Land Management  
Protocol No. 9 by May 21, 2024

The head of the academic council \_\_\_\_\_ Taras IEVSIUKOV