

Department of Geoinformatics and Aerospace Research of the Earth

**"CONFIRMED"**  
Dean of the Faculty of Land management  
T.O. Ievsiukov  
«18» May 2023

**"APPROVED"**  
at the meeting of the department of Geoinformatics  
and Aerospace Research of the Earth  
Protocol № 11 from 14 April 2023  
Ap. head of Department  
O. P. Drozdivskyi

**"REVIEWED "**  
Program Coordinator  
I.P. Kovalchuk.

## PROGRAM OF THE COURSE

### DIGITAL PLANS AND MAPS

Specialization	<u>193. Geodesy and Land management</u>
Educational program	<u>"Geodesy and Land Management"</u>
Faculty	<u>Land Management</u>
Developers	<u>Dr. Sci., Prof. Kokhan S.S.</u>
	<u>phD Moskalenko A.A.</u>

## 1. Description of the course

### Digital plans and maps

<b>Branch of knowledge, direction of education, specialty, educational-qualification level (EQL)</b>		
Educational qualification level	Bachelor	
Specialty	193 Geodesy and Land management	
Educational program	Geodesy and Land management	
<b>Discipline characteristic</b>		
Type	Selected	
Total hours	90	
ECTS credits	3	
Thematic modules	2	
Course project (work) (if exist)		
type of examination	Final test	
<b>Discipline parameters for full-time students and students studied by correspondence</b>		
	full-time study	by correspondence
year of training	3	
semester	6	
lectures	15 hours.	
practical, seminar	- hours.	
laboratory	45 hours.	
self-dependent work	30 hours.	
individual work	- hours.	
Number of classroom hours (for full-time students) per week	4 hours.	

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

**Purpose of the course:** The course "Digital plans and maps» provides obtaining skills of GIS cartographic modeling for land management and land cadaster.

**Tasks of discipline** is forming the specialist and subsequent practical use of technologies of GIS mapping in particular technologies of digital mapping knowledge and provide skills for collecting geographic information and work on a computer in ArcGIS environment, and GIS cartographic modeling.

**Acquisition of competencies:**

**Integrated competency (IC)**

IC. The ability to solve complex specialized problems of geodesy and land management

**- general competencies:**

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 09. Ability to interpersonal interaction.

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

**- special competencies:**

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 02. Ability to apply theories, principles, methods of physical and mathematical, natural, socio-economic, engineering sciences in performing tasks 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 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.

**3. Program and structure of the course for:  
– complete full-time (part-time) form of study;**

Modules and topics	Hours												
	full-time study							correspondence					
	weeks	total	including					total	including				
			l	p	lab	ind	s.w.		l	p	lab	ind	
1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>Semantic module 1. CARTOGRAPHY AND GEOINFORMATICS</b>													
Theme 1. The main terminology in digital mapping	1-2	11	2		4		5						
Theme 2. Methods of displaying objects	3-4	17	2		10		5						
Theme 3. Standardization of geographic information	5-6	17	2		10		5						
<b>Total by Semantic module 1</b>		<b>45</b>	<b>6</b>		<b>24</b>		<b>15</b>						
<b>Semantic module II. TECHNOLOGIES OF DIGITAL MAPPING</b>													
Theme 4. Sources for digital mapping and map construction	7-8	13	2		6		5						
Theme 5. Technology of digital maps and plans design	9-12	17	4		8		5						
Theme 6. Classificatory of electronic map	13-15	15	1		7		5						
<b>Total by Semantic module 2</b>		<b>45</b>	<b>9</b>		<b>21</b>		<b>15</b>						
<b>Total</b>		<b>90</b>	<b>15</b>		<b>45</b>		<b>30</b>						

**4. Seminar topics**

№	Topic	Hours

**5. Practical class topics**

№	Topic	Hours

**6. Laboratory class topics**

№	Topic	Hours
1	Work with layers of basic map	2
2	Construction of digital symbols (points) for maps and various scales	2
3	Construction of digital symbols (lines) for maps and various scales	4

4	Construction of digital symbols (polygons) for maps and various scales	6
5	Objectives and their attributes. Data coding.	6
6	Map composition	4
7	Creating digital map by variant	4
8	Editing digital map by variant	2
9	Filling the knowledge base of digital maps by variant	2
10	Creating digital map by variant in ArcGIS Online	4
11	Editing digital map by variant in ArcGIS Online	3
12	Map composition in ArcGIS Online	4
<b>Total</b>		<b>45</b>

### 7. Independent work topics

N <sup>o</sup>	<i>Topic</i>	Hours
1	Professional terminology of digital maps and plans	5
2	Cartographic symbols. Representation of relief	5
3	Geoinformation mapping data formats	5
4	Data sources for creating digital maps and plans	5
5	Analysis of the use of digital maps and plans in various sectors (according to scientific articles and publications)	5
6	The knowledge base of digital maps	5
<b>Total</b>		<b>30</b>

### 8. Samples of control questions, tests for assessing the level of knowledge acquisition by students

1. Interaction of cartography and geoinformatics.
2. Relief image.
3. Sources of information for maps and plans, characteristics of their informativeness.
4. Methods of using digital maps.
5. Geoinformation mapping.
6. Virtual mapping.
7. Geoimages. Types of geoimages.
8. Graphic images.
9. Theory of geoimages.
10. Generalization of geoimages.
11. Digital cartographic information.
12. Requirements for digital cards.
13. Geoeconometrics - definition and use.
14. Electronic atlases.
15. Mathematical and cartographic modeling.
16. The concept of cartographic modeling.
17. The concept of digital map.
18. Graphic representation of objects.
19. Classification of digital maps.
20. Cartographic image. Digital cartographic information.
21. Requirements for digital cards.
22. Sources of information for creating maps.
23. Cartography and geoinformatics.

24. Hardware and software for digital cartography.
25. Data formats.
26. Network technologies and the Internet
27. Digital mapping technologies.
28. Technology of entering cartographic data
29. Digitization of maps and plans.
30. The most common mistakes in digitization.
31. Raster scanning. Factors influencing the choice of technological link
32. Metadata as “data about data”.
33. Basic provisions for the creation of electronic maps of the area.
34. Description of the structure of information and object composition of the electronic map of the area.
35. Classifiers and codifiers. Classifier of topographic information.
36. Electronic map of the area, the basic requirements for its creation.

## 9. Teaching methods

In conducting lectures appropriate to use verbal teaching methods: explanation, narration, discussion, educational debate, with a combination of visual learning methods: illustration, showing.

In carrying out laboratory work should be used such as verbal learning method of instruction on the combination of visual learning methods of illustration and demonstration, the aspect of these studies is that they facilitate communication theory and practice, providing students acquiring skills using standard and specialized software, application of information technology to cadastral and form students' initial skills of research activities. Laboratory work in the laboratory are equipped computers.

## 10. Forms of assessment

Module number	Module name	Theme Lecture	Theme of laboratory lesson	Form of control
I	Cartography and geoinformatics	Theme 1. The main terminology in digital mapping	Work with layers of basic map	Protection of laboratory work / assessment of modular control work
			Construction of digital symbols (points) for maps and various scales	
		Theme 2. Methods of displaying objects	Construction of digital symbols (lines) for maps and various scales	
			Construction of digital symbols (polygons) for maps and various scales	
		Objectives and their attributes. Data coding.		
Theme 3. Standardization of geographic information	Map composition			
II	Technologies of digital mapping	Theme 4. Sources for digital mapping and map construction	Creating digital map by variant	Protection of laboratory work / assessment of modular control work
			Editing digital map by variant	
		Theme 5. Technology of digital maps and plans design	Filling the knowledge base of digital maps by variant	
			Creating digital map by variant in ArcGIS Online	
		Theme 6. Classificatory of electronic map	Editing digital map by variant in ArcGIS Online	
			Map composition in ArcGIS Online	

The main methods of control of knowledge and skills students have to study the subject "Digital plans and maps" are: oral examination, written and practical test, standardized control in the form of modular test papers, assessment for individual learning task, the final test.

The total value of these methods is to make the best possible to ensure timely and comprehensive feedback between students and teachers, by which establishes how students perceive and learn the material.

The purpose determines the choice of control methods, it should be borne in mind that these methods can be applied in all kinds of control - only complete applications allows regularly and objectively identify the dynamics of the formation of knowledge and skills of students. Each control method has its advantages and disadvantages, scope of application, none of them can not be the only one able to diagnose all aspects of the learning process. So:

- to control the absorption of lectures: oral questioning, written modular test papers, current testing score for an individual learning task, the final test.

- for the monitoring and evaluation of laboratory work: practical test and evaluation of each laboratory work..

#### 11. Distribution of grades received by students.

Evaluation of student knowledge is carried out on a 100-point scale and is converted to national grades according to Table 1 "Regulations and Examinations and Credits at NULES of Ukraine" (order of implementation dated 26.04.2023, protocol №10)

Student rating, points	National grade based on exam results	
	Exams	Credits
90-100	Excellent	Passed
74-89	Good	
60-73	Satisfactory	
0-59	Unsatisfactory	Not passed

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):  $R_{dis} = R_{aw} + R_{ex}$ .

	Тип роботи	Module			Дисципліна		
		бали за роботу	відсоток по		всього балів	відсоток за модулями	всього
			роботі	модулю			
Module # 1	Laboratory work #1	100	5 %	70 %	100	35 %	100
	Laboratory work #2	100	8 %				
	Laboratory work #3	100	10 %				
	Laboratory work #4	100	15 %				
	Laboratory work #5	100	10 %				
	Laboratory work #6	100	10 %				
	Self-work#1	100	12 %				
	Self-work#2	100	3 %				
	Self-work#3	100	4 %				
Module test / control	100	30 %	30 %				
Module # 2	Laboratory work #7	100	15 %	70 %	100	35 %	100
	Laboratory work #8	100	8 %				
	Laboratory work #9	100	15 %				
	Laboratory work #10	100	5 %				
	Laboratory work #11	100	7 %				
	Laboratory work #12	100	10 %				
	Self-work#4	100	4 %				
	Self-work#5	100	3 %				
	Self-work#6	100	3 %				
Module test / control	100	30%	30 %				
Final test		100				30 %	

## 12. Educational and methodological support

1. Кохан С.С., Москаленко А.А. Цифрові плани і карти. Навчально-методичний посібник для студентів напряму підготовки «Геодезія, картографія та землеустрій». -К.: ЦК «КОМПРИНТ», 2015.

2. Кохан С.С., Москаленко А.А., Іванюта О.О., Новиков О.І. Цифрові плани і карти. Навчально-методичний посібник для студентів напряму підготовки «Геодезія, картографія та землеустрій». -К.: ЦК «КОМПРИНТ», 2014.

3. Кохан С.С., Москаленко А.А., Методичні вказівки до виконання лабораторних робіт з дисципліни «Digital Plans and Maps» (Цифрові плани та карти, англійською мовою) – К: "Компринт" – 2021. – 104 с.

## 13. Recommended sources of information

### Basic:

1. ArcGIS for Environmental and Water Issues / William Bajjali. - 2018 - p.362
2. Manual of Digital Earth / Huadong Guo, Michael F. Goodchild, Alessandro Annoni – Springer Open 2020. – p.846 (<https://doi.org/10.1007/978-981-32-9915-3>)
3. Geoinformation mapping for providing the rational use and protection of soil / A Moskalenko // Mechanization in agriculture & Conserving of the resources 65 (Issue 5), 186-189
4. Quantitative Land Suitability Mapping for Crop Cultivation // Kokhan, A Moskalenko, O Drozdovskyi // ommunications - Scientific Letters of the University of Zilina, 77-83
5. Moskalenko A. GIS support of forming spatial decisions on land use // International Scientific Journal Mechanization in agriculture & Conserving of the resources, Vol. 67 (2021), Issue 3, p.79-81.

6. Бондаренко Е.Л. Геоінформаційне еколого-географічне картографування.– К.: Фітосоціоцентр, 2007.–272 с
7. Геоінформаційні системи і бази даних : монографія. – Кн. 2 / В. І. Зацерковний, В. Г. Бурачек, О. О. Железняк, А. О. Терещенко. – Ніжин : НДУ ім. М. Гоголя, 2017. – 237 с
8. Козаченко Т. І. Геоінформаційне картографування малих підприємств України [Електронний ресурс] / Т. І. Козаченко, Т. С. Цокало // Вісник геодезії та картографії. - 2009. - № 4. - С. 17-27. - Режим доступу: [http://nbuv.gov.ua/UJRN/vgtk\\_2009\\_4\\_5](http://nbuv.gov.ua/UJRN/vgtk_2009_4_5)
9. Лященко А. А. Сервіс – орієнтована архітектура кадастрових геоінформаційних систем та кадастрових геопорталів / А. А. Лященко, Ж. В. Форосенко, А. Г. Черін // Вісн. геодезії та картографії. – 2011. – № 1. – С. 35 – 42.

#### **Additional:**

1. Національний стандарт України «ДСТУ ISO 19101:2009 Географічна інформація. Еталонна модель (ISO 19101:2002, IDT)»// 2009-10-15.
2. СОУ ISO 19136:2009 "Обмінний формат геопросторових даних на основі географічної мови розмітки GML (ISO 19136:2007)" // 30.09.2010.
3. СОУ 742-33739540 0011:2010 "Комплекс стандартів База топографічних даних Каталог об'єктів і атрибутів" // 30.09.2010.
4. СОУ ISO 19113 "Комплекс стандартів База топографічних даних Принципи оцінки якості топографічних даних" // 30.09.2010.
5. СОУ 742-33739540 0012:2010 "Комплекс стандартів. База топографічних даних. Правила кодування та цифрового опису векторних даних" Том 2 // 30.09.2010.
6. СОУ 742-33739540 0012:2010 "Комплекс стандартів База топографічних даних Правила кодування та цифрового опису векторних даних" Том 2 // 30.09.2010.
7. СОУ 742-33739540 0012:2010 "Комплекс стандартів База топографічних даних Правила кодування та цифрового опису векторних даних" Том 1 // 30.09.2010.
8. СОУ ISO 19113 "Комплекс стандартів База топографічних даних Принципи оцінки якості топографічних даних" // 30.09.2010.
9. СОУ 742-33739540 0010:200 "Комплекс стандартів База топографічних даних Загальні вимоги" // 29.09.2010.
10. ISO 19103 – Мова концептуальної схеми.
11. ISO 19107 – Просторова схема.
12. ISO 19133 – Сервіси спостереження та навігація на основі інформації про місцезнаходження.
13. ISO 19136 – Geography mark up language.

#### **14. Information resources:**

1. **eLearn webpage** - <https://elearn.nubip.edu.ua/course/view.php?id=106>
2. Карпінський Ю. О., Лященко А. А. Режим доступу: <http://ena.lp.edu.ua:8080/Bitstream/ntB/10582/1/37.pdf>
3. Grass GIS. [Електронний ресурс] // [сайт] / Режим доступу: <http://grass.osgeo.org/> – назва з екрану.
4. The ArcGIS Book [Електронний ресурс] // [сайт] / Режим доступу: <https://learn.arcgis.com/en/arcgis-book/> – назва з екрану.