

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ БІОРЕСУРСІВ І ПРИРОДОКОРИСТУВАННЯ УКРАЇНИ

«Положення про робочу програму навчальної дисципліни»

СУ СМЯ НУБіП України
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Введено в дію:
Наказ №
від

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Geoinformatics and Aerospace Research of the Earth

APPROVED

Faculty of Land Management

May 15, 2025

CURRICULUM OF ACADEMIC DISCIPLINE

GEOINFORMATICS, COMPUTER SCIENCE AND PROGRAMMING

Area of knowledge <u>19. Architecture and Construction</u>

Specialty <u>193. Geodesy and Land Management</u>

Academic programme "Geodesy and Land Management"

Faculty <u>Land Management</u>

Developed by: Assistant Professor, PhD Anastasia HORODNYCHA

(position, academic degree, academic title)

Description of the academic discipline

The discipline "Geoinformatics, Computer Science and Programming" provides the formation of theoretical knowledge and skills in the use of computer technologies by land surveyors in their practical work. The basics of spatial thinking, the basics of geoinformatics, modeling of geographic objects in geoinformatics, working with vector data, familiarization with GIS and databases are considered. Students form basic ideas about geospatial information and its presentation, acquire practical skills in working with software tools, in particular Google Earth Pro .

Area of knowledge, specia	alty, academic programme	e, academic degree
Academic degree		Bachelor`s
Specialty	193. Geodesy	and Land Management
Academic programme	Geodesy ar	nd Land Management
Chara	acteristics of the discipline	
Type		Required
Total number of hours		60
Number of ECTS credits		2
Number of modules		2
Course project (work) (if any)		-
Form of assessment		Exam
	emic discipline indicators	
for full-time and	part-time forms of higher	
		ining higher education
	daytime	correspondence
Year of study	2	1
Term	3	2
Lectures	3 hours	2 hours
Practical classes and seminars	-	-
Laboratory classes	30 hours	-
Self-study	3 hours	-
Number of hours per week for full-time students	3 hours	_

1. Aim, competences and expected learning outcomes of the discipline

"Geoinformatics, Computer Science and Programming" is studied for the first three semesters and provides the opportunity to use computer technologies by specialists in the field of geodesy and land management in their practical work.

Competences acquired:

Integral competence (IC):

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

General competence (GC):

- GC01. Ability to learn and master modern knowledge.
- GC02. Ability to apply knowledge in practical situations.
- GC05. Ability to communicate in a foreign language.
- GC06. Ability to use information and communication technologies.
- GC07. Ability to work autonomously.
- GC08. Ability to work in a team.

GC13. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the 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 engineering, to use various types and forms of physical activity for recreation and leading a healthy lifestyle.

Special (professional) competence (SC):

SC04. Ability to select and use effective methods, technologies and equipment for carrying out professional activities in the field of geodesy and land management.

SC06. Ability to perform remote, ground, field and office research, engineering calculations for processing research results, formalize research results, prepare reports when solving geodesy and land management tasks.

SC07. Ability to collect, update, process, critically evaluate, interpret, store, publish and use geospatial data and metadata regarding objects of natural and man-made origin.

SC09. Ability to use tools, devices, equipment, and facilities when performing geodesy and land management tasks.

SC10. Ability to monitor and assess land.

Expected learning outcomes (ELO):

ELO01. Communicate freely in oral and written forms in the state and foreign languages on matters of professional activity.

ELO02. Organize and manage the professional development of individuals and groups.

ELO03. Communicate information, ideas, problems, solutions, own experience, and arguments to specialists and non-specialists.

ELO04. Know and apply in professional activities regulatory and legal acts, regulatory and technical documents, reference materials in the field of geodesy and land management and related industries.

ELO09. Collect, evaluate, interpret and use geospatial data, metadata regarding 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.

ELO10. Select and apply tools, equipment, facilities, and software necessary for remote, terrestrial, field, and desk-based research in the field of geodesy and land management.

ELO11. Organize and perform remote, ground, field and office work in the field of geodesy and land management, document the results of the work, and prepare relevant reports.

ELO15. Develop and make effective decisions regarding professional activities in the field of geodesy and land management, including under conditions of uncertainty.

2. Program and structure of the discipline

full-time study period

	Number of hours												
Modules and topics		full-time						part-time					
Modules and topics	weeks	total		i	ncludi	ing		total			inc	luding	
	weeks	totai	1	p	lab	ind	s.st	totai	1	p	lab	ind	s.st.
Module 1. Fundamentals of Geoinformatics													
Topic 1. From geography to geoinformatics	1-2	6	2		4			1	1				
Topic 2. Basics of spatial thinking	3-4	21	2		4		15						
Topic 3. Domains of geographic information	5-6	8	2		6								

Total by module 1	35	5	6		14		15	1	1			
Modu	le 2. Mo	deling	geogi	rap	hic ol	jects	in ge	oinforr	natio	cs		
Topic 1. Geographical fields	7-8	4	2		4			1	1			
and objects as the main												
entities of geographical space												
Topic 2. Vector and object	9-10	6	2		4							
models of spatial data												
Topic 3. Mosaic spatial data	11-12	6	2		4							
models												
Topic 4. From geoinformatics	13-15	7	3		4							
to GIS and databases												
Total by module 2	25	5	9		16		0					
Total hours	60)	15		30		15	2	2			

3. Topics of lectures

$N_{\underline{0}}$	Topic	Hours
1	From geography to geoinformatics	2
2	Basics of spatial thinking	2
3	Domains of geographic information	2
4	Geographical fields and objects as the main entities of geographical space	2
5	Vector and object spatial data models	2
6	Mosaic spatial data models	2
7	From geoinformatics to GIS and databases	3
	Total	15

4. Topics of laboratory classes

No	Topic	Hours
1	Getting to know the Google interface Earth Pro	2
2	Configuring Google Earth Pro software	2
3	Search and organize geographic search results using Google tools Earth Pro	2
4	Geometric Primitives on Google Earth Pro: Types, Creating, and Customizing Styles. Part 1.	2
5	Geometric Primitives on Google Earth Pro: Types, Creating, and Customizing Styles. Part 2.	2
6	Working with 4D data in Google Earth Pro.	2
7	Cartometric operations in Google Earth Pro, video presentation of work results	2
8	Basics of working with QGIS	2
9	Working with map layers. Part 1	2
10	Working with map layers. Part 2	2
11	Getting information about layer objects	2
12	Search for objects by attribute data	2
13	Cartometric operations	2
14	Map Layout. Part 1	2
15	Map Layout. Part 2.	2
	Total	30

5. Topics of self-study

No	Topic	Hours
1	Maps.visicom.ua – Ukrainian geospatial data portal	15
	Total	15

6. Methods and means of diagnosing learning outcomes:

- oral or written survey;
- discussions;
- speech with presentations;

- testing;
- defense of laboratory work;
- defense of essays.

7. Teaching methods:

- problem-based learning;
- practice-oriented learning;
- case method;
- visual method;
- flipped classroom;
- learning through research;
- video method;
- independent work.

8. Results assessment.

The knowledge of a higher education applicant is assessed on a 100-point scale and is converted into a national assessment in accordance with the current "Regulations on Examinations and Tests at the NULES of Ukraine"

8.1. Distribution of points by types of educational activities

Educational activity	Results	Assessment						
Module 1.	Fundamentals of Geoinformatics							
Topic 1. From geography to geoinformatics								
Laboratory work 1. Getting to know the	Know the prerequisites for the development of	8						
Google interface Earth Pro	geoinformatics as a science and the basic							
Laboratory work 2. Configuring Google	techniques of Google's work Earth Pro	7						
Earth Pro Software	Be able to customize the interface and set							
	settings for working with the Google							
	application Eatrh Pro							
	Apply practical skills in working with software							
	tools. ELO01; ELO04; ELO15							
Topic	2. Basics of spatial thinking							
Laboratory work 3. Searching and	Know the basics of spatial thinking	5						
organizing search results for geographic	Be able to search and organize search results							
objects using Google tools Earth Pro	for geographic objects using Google tools Earth							
Laboratory work 4. Geometric Primitives	Pro	5						
in Google Earth Pro: Types, Creating,	Apply geometric primitives to represent objects							
and Styling. Part 1.	and their display styles. ELO01; ELO02;							
Self-study 1. Maps.visicom.ua –	ELO03; ELO09; ELO10; ELO11	15						
Ukrainian geospatial data portal								
	Domains of geographic information							
Laboratory work 5. Geometric Primitives	Know the domains of geographic information	10						
in Google Earth Pro: Types, Creating,	Be able to work with 4D data in Google Earth							
and Customizing Styles. Part 2.	Pro							
Laboratory work 6. Working with 4D	Apply practical skills in performing	10						
data in Google Earth Pro.	cartometric operations in Google Earth Pro.							
Laboratory work 7. Cartometric	ELO01; ELO03; ELO09; ELO10; ELO11	10						
operations in Google Earth Pro, video								
presentation of the results of the work								
Modular test 1.		30						
Total by module 1		100						

Module 2. Modelin	ng geographic objects in geoinformatics					
Topic 1. Geographical fields and objects as the main entities of geographical space						
Laboratory work 8. Basics of working with QGIS	Know the essence of definitions of geographic fields and geographic objects Be able to customize the interface and set parameters for working with the QGIS program Apply practical skills in working with layers in QGIS. ELO01; ELO02; ELO03; ELO09; ELO10; ELO11	15				
	or and object models of spatial data					
Laboratory work 9. Working with map	Know the advantages and disadvantages of	5				
layers. Part 1	representing spatial data through vector data					
Laboratory work 10. Working with Map	models	5				
Layers. Part 2	Be able to get information about layer objects.	4.0				
Laboratory work 11. Obtaining	ELO01; ELO02; ELO03; ELO04; ELO15	10				
information about layer objects	2. Manaia ana 4i al da 4a ana dala					
	3. Mosaic spatial data models	10				
Laboratory work 12. Searching for	Know the advantages and disadvantages of	10				
objects by attribute data	representing spatial data through mosaic data models	10				
Laboratory work 13. Cartometric operations	Be able to search for objects by attribute data	10				
Operations	Apply practical skills in performing					
	cartometric operations. ELO02; ELO03;					
	ELO04; ELO15					
Topic 4. From	geoinformatics to GIS and databases					
Laboratory work 14. Map layout. Part 1	Know the basic concepts of geospatial	10				
Laboratory work 15. Map layout. Part 2.	information and its representation in GIS	5				
	Be able to develop simple layouts					
	Apply basic techniques for spatial data					
	presentation					
	ELO09; ELO10; ELO11; ELO15					
Modular test 2.		30				
Total by module 2		100				
	Educational work $ (M1 + M2)/2*0.7 \le 70 $					
Exam	30					
Total per course $(Coursework + exam) \le 1$						

8.2. Scale for assessing student's knowledg

Assessment according to the national system (exams/credits)
perfectly
good
satisfactorily
unsatisfactorily

8.3. Assessment policy

Deadlines and exam retaking rules

Academic Integrity Policy	Cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct text references to the literature used
Attendance Policy	at classes is mandatory. For objective reasons (e.g. illness, international internship), studies may be conducted individually (online upon agreement with the dean of the faculty).

9. Educational and methodological support:

- electronic educational course of the academic discipline (on the educational portal of the NUBiP of Ukraine eLearn https://elearn.nubip.edu.ua/enrol/index.php?id=707);
- lecture notes and their presentations (in electronic form https://elearn.nubip.edu.ua/enrol/index.php?id=707);
 - textbooks, study guides, workshops;
- methodological materials for studying the academic discipline for full-time and parttime higher education students.
 - Methodical instructions for teaching practice in the discipline "Geoinformatics, Computer Science and Programming" (2nd year) / L. Primak, A. Moskalenko. Kyiv, 2023. 68 p.
 - Methodical instructions for teaching practice in the discipline "Geoinformatics, Computer Science and Programming" (1st year) / A. Moskalenko, O. Shykula, I. Shkvyr. Kyiv, 2022. 64 p.
 - Lecture notes on the discipline "Geoinformatics". Part 1 (for students of the direction of training "Geodesy, cartography and land management") / O. Shykula, I. Shkvyr, A. Moskalenko, T. Gez. Kyiv, 2015. 241 p.
 - Lecture notes on the discipline "Geoinformatics". Part II (for students of the direction of training "Geodesy, Cartography and Land Management") / O. Shykula, I. Shkvyr, A. Moskalenko. Kyiv, 2015. 305 p.

10. Recommended sources of information

Main:

- 1. Sandra L. Arlinghaus, Joseph J. Kerski, Ann Evans Larimore, Matthew Naud. Spatial Thinking in Environmental Contexts. Maps. Maps, Archives, and Timelines. 1st Edition. 2023. 248
- 2. Bolstad P., Manson S. GIS Fundamentals: A First Text on Geographic Information Systems. 7th Edition. 2022. 764 p.
- 3. Pavlysh V., Glinenko L., Shakhovska N. Fundamentals of Information Technologies and Systems. Lviv: Lviv Polytechnic. 2018. 620p.
- 4. Karpinsky Yu., Lyashchenko A., Lazorenko N., Kin D. Fundamentals of creating interoperable geospatial data. Kyiv. KNUBA. 2023.302 p.

Auxiliary:

- 5. James Holler. The Microsoft Office 365 Bible: The Most Updated and Complete Guide to Excel, Word, PowerPoint, Outlook, OneNote, OneDrive, Teams, Access, and Publisher from Beginners to Advanced. 2022. 359 p.
 - 6. Alexander M., Kusleika D. Microsoft Excel 365 Bible. Wiley 2022. 1072

- 7. Ellen Lupton, Jennifer Cole Phillips. Graphic Design. New Basics. Kyiv: ArtHuss. 2019. 262 p.
- 8. Berinato S. Good Diagrams. Tips, Tools, and Exercises for Better Data Visualization. Kyiv: ArtHuss. 2022. 288 p.
 - 9. Mark Lutz. Python. Programmer's Handbook. Kyiv: Naukovyi svit. 2023. 294 p.
- 10. Paul Berry. Head First. Python: An Easy-to-Understand Reference. Kharkiv: 2021. 624 p.
- 11. Shipulin V. D. Basic principles of geoinformation systems: a textbook. Kharkiv: KhNAMG, 2010. 313 p.
 - 12. Moodle Documentation. URL: https://docs.moodle.org/403/en/Main_page
 - 13. Word help & learning. URL: https://support.microsoft.com/en-us/word
 - 14. Excel help & learning. URL: https://support.microsoft.com/en-us/excel
- 15. Python Language Reference. URL: https://docs.python.org/uk/3/reference/index.html
- 16. Online IDE Code Editor, Compiler, Interpreter. URL: https://www.online-ide.com/
 - 17. Google Earth Help. URL:

https://support.google.com/earth/?hl=en#topic=7364880

18. QGIS User Guide. URL:

https://docs.qgis.org/3.28/en/docs/user_manual/index.html