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
GEOINFORMATICS, INFORMATICS AND PROGRAMMING

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

Kyiv – 2024

Description of the course Geoinformatics, Informatics and Programming

Branch of knowledge, direction of education, specialty, educational-qualification level (EQL)	
Educational qualification level	Bachelor
Specialty	193 Geodesy and Land management
Educational program	Geodesy and Land Management
Description of the course	
Type	Compulsory
Total number of hours	180
Number of credits ECTS	6
Number of content modules	6
Course project (work)	-
Form of Control	Test, Exam, Exam
Discipline parameters for full-time students and students studied by correspondence	
	Full-time
Year of training	1-2
Semester	1-2-3
Lectures	15-15-15
Practical, seminars	-
Laboratory studies	30-30-30
Self-dependent work	15-15-15
Number of weekly hours for full-time study: classroom	2-2-2

1. Goal and tasks of the discipline
Geoinformatics, Informatics and Programming

Aim of the discipline: "Geoinformatics, informatics and programming" is studied in the first three semesters and provides the possibility of using computer technologies by specialists in geodesy and land management in their practical work.

Tasks of discipline is to develop an expert understanding of the prospects for further development and practical use of computer technology, theoretical knowledge and practical computer skills among OS WINDOWS, basic techniques using the Microsoft Office package Office, writing a program using high-level language Python. At the end of the course, study the foundations of geoinformatics, which form students' knowledge related to the study of geospatial as a holistic system of diverse objects with their properties and various ways of visualization.

Acquisition of competencies:

Integrated competency (IC)
IC. The ability to solve complex specialized problems of geodesy and land management
- general competencies:
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. 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:***

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

SC06. 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.

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

SC09. Ability to use tools, instruments, equipment, facilities in the performance of geodetic and land management tasks.

SC10. Ability to monitor and evaluate land.

learning results:

LR2. Organize and manage the professional development of individuals and groups.

LR3. Communicate information, ideas, problems, solutions, personal experience and arguments to specialists and non-specialists.

LR4. 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.

LR9. Collect, evaluate, interpret and use geospatial data, metadata on objects of natural and manmade origin, apply statistical methods of their analysis to solve specialized problems in the field of geodesy and land management.

LR10. Select and apply tools, equipment, hardware and software required for remote, terrestrial, field and in-house surveys in the field of geodesy and land management.

LR11. Organize and perform remote, ground, field and camera work in the field of geodesy and land management, prepare the results of the work, prepare relevant reports.

LR15. Develop and make effective decisions on professional activities in the field of geodesy and land management, including under conditions of uncertainty.

2. Program of the discipline

Modules and topics	Hours											
	full-time study							correspondence				
	weeks	Total	weeks					Total	weeks			
			l	p	lab	ind	s.w.		л	п	лаб	інд
1	2	3	4	5	6	7	8	9	10	11	12	13
Semester I												
Module1. Information technologies in geodesy and land management												
Theme 1. Theoretical prerequisites for the study of geoinformatics	1-2	19	2		2		15					
Theme 2. Modern technical means of working with data	3-4	8	2		6							
Theme 3. Digital transformation	5-6	4	2		2							
Total module1		*31*	*6*		*10*		*15*					
Module2. Processing of land management information in word processors												
Theme 4. Use of word processors when performing land management works	7-8	8	2		6							
Theme 5. Working with tables in text editors	9-10	4	2		2							
Theme 6. Work with graphic objects in text editors	11-12	6	2		4							
Theme 7 Work with scientific and technical documentation	13-15	11	3		8							
Total module2		*29*	*9*		*20*		*0*					
Total Semester I		**60**	**15**		**30**		**15**					

Semester II											
Module1 (3). Processing of land management information in table processors											
Theme 1 (8). The use of table processors when performing land management works	1-2	23	2		6		15				
Theme 2 (9). Work with formulas and functions in spreadsheet processors	3-4	6	2		4						
Theme 3 (10). Visualization of data in the form of diagrams by means of spreadsheet processors	5-6	6	2		4						
Total module1 (3)		*35*	*6*		*14*		*15*				
Module2 (4). Processing of land management information using high-level programming languages											
Theme 4 (11). Modern programming languages. The basic syntax of the Python language	7-8	6	2		4						
Theme 5 (12). The concept of control structures in programming. Functions	9-10	6	2		4						
Theme 6 (13). Work with complex data types	11-12		2		4						
Theme 7 (14). Work with files	13-15	8	3		4						
Total module2 (4)		*25*	*9*		*16*		*0*				
Total Semester II		**60**	**15**		**30**		**15**				
Semester III											
Module1 (5). Fundamentals of geoinformatics											
Theme 1 (15). From geography to geoinformatics	1-2	6	2		4						
Theme 2 (16). Basics of spatial thinking.	3-4	16	2		4		15				
Theme 3 (17). Domains of geographic information	5-6	8	2		6						
Total module1 (5)		*35*	*6*		*14*		*15*				
Module2 (6). Modeling of geographic objects in geoinformatics											
Theme 4 (18). Geographical fields and objects as the main entities of geographical space	7-8	4	2		4						
Theme 5 (19). Vector and object models of spatial data	9-10	6	2		4						
Theme 6 (20). Mosaic models of spatial data	11-12	6	2		4						
Theme 7 (21). From geoinformatics to GIS and databases	13-15	7	3		4						
Total module2 (6)		*25*	*9*		*16*						
Total Semester III		*60*	*15*		*30*		*15*				
Усього годин		**180**					**45**				

3. Laboratory class topics

№	Topic	Hours
	Semester I	
	Module 1. Information technologies in geodesy and land management	
1	Work in the Windows OS environment. Basic actions with files and folders	2
2	Moodle distance learning information system of the university. Part1	2
3	Moodle distance learning information system of the university. Part 2	2
4	Moodle distance learning information system of the university. Part 3	2
5.	Work with antivirus programs	2
	Module 2. Processing of land management information in word processors	
6	Text editing and formatting. Part 1	2
7	Text editing and formatting. Part 2	2
8	Entering special characters in MS Word	2
9	Working with tables in MS Word	2
10	Work with simple graphic images in the form of flowcharts in text documents	2
11	Working with WordArt text, SmartArt pictures and other graphics in MS Word	2

12	Work with the formula editor and elementary calculations in MS Word	2
13	Word processor MS Word: work with links and footers	2
14	Document review in MS Word	2
15	Text editor MS Word. Document review	2
Total Semester I		*30*

Semester II		
Module 1 (3). Processing of land management information in table processors		
1 (16)	Creation of spreadsheets and data entry in MS Excel spreadsheet	2
2 (17)	Formatting and editing the table structure in MS Excel	2
3 (18)	Conditional formatting of table cells	2
4 (19)	Work with formulas in the MS Excel table editor	2
5 (20)	Working with sheets in the MS Excel table editor, exchanging data between sheets	2
6 (21)	Table editor MS Excel: work with diagrams	2
7 (22)	MS Excel table editor: creation of value distribution diagrams	2
Module 2 (4). Processing of land management information using high-level programming languages		
8 (23)	Basics of programming in Python	2
9 (24)	Program structure, data, expressions and operations in Python	2
10 (25)	Programming functions in Python	2
11 (26)	Conditional and looping flow control structures in the Python programming language	2
12 (27)	Lists and tuples (records) in Python	2
13 (28)	Arrays in Python	2
14 (29)	Dictionaries and working with files in Python	2
15 (30)	Date and time objects in Python	2
Total Semester II		*30*

Semester III		
Module 1 (5). Fundamentals of geoinformatics		
1 (31)	Introduction to the Google Earth Pro interface	2
2 (32)	Setting up Google Earth Pro software	2
3 (33)	Search and organization of search results for geographic objects using Google Earth Pro	2
4 (34)	Geometric primitives in Google Earth Pro: types, creation and customization of styles. Part 1.	2
5 (35)	Geometric primitives in Google Earth Pro: types, creation and customization of styles. Part 2.	2
6 (36)	Working with 4D data in Google Earth Pro.	2
7 (37)	Cartometric operations in Google Earth Pro, video presentation of work results	2
Module 2 (6). Modeling of geographic objects in geoinformatics		
8 (38)	The basics of working with QGIS	2
9 (39)	Working with map layers. Part 1	2
10 (40)	Working with map layers. Part 2	2
11 (41)	Getting information about layer objects	2
12 (42)	Search for objects by attribute data	2
13 (43)	Cartometric operations	2
14 (44)	Map layout. Part 1	2
15 (45)	Map layout. Part 2	2
Total Semester III		*30*
Total		**90**

4. Self-dependent work

№	Topic	Hours
1	2	3
1.	Working with Google Drive	15
2	Excel Drop Down List using Data Validation and Excel Tables that updates dynamically	15
3.	Maps.visicom.ua is a Ukrainian geospatial data portal	15
	Total	45

5. Means of diagnosing learning outcomes:

- final test;
- 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 results	
	Exam	Final test
90-100	**Excellent**	**pass**
74-89	**Good**	
60-73	**Satisfactory**	
0-59	**Unsatisfactory**	**Not pass**

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 -
http://elearn.nubip.edu.ua/course/view.php?id=705 ;
http://elearn.nubip.edu.ua/course/view.php?id=706 ;
http://elearn.nubip.edu.ua/course/view.php?id=707 ;
http://elearn.nubip.edu.ua/course/view.php?id=2436 ;

http://elearn.nubip.edu.ua/course/view.php?id=2437 ;
http://elearn.nubip.edu.ua/course/view.php?id=2438);
      - abstracts of lectures and their presentations (in electronic form -
http://elearn.nubip.edu.ua/course/view.php?id=705 ;
http://elearn.nubip.edu.ua/course/view.php?id=706 ;
http://elearn.nubip.edu.ua/course/view.php?id=707 ;
http://elearn.nubip.edu.ua/course/view.php?id=2436 ;
http://elearn.nubip.edu.ua/course/view.php?id=2437 ;
http://elearn.nubip.edu.ua/course/view.php?id=2438);

      - 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:

- ✓ Methodologiacal guideline for education practice of discipline з дисципліни «Geoinformatics, informatics and programming» (2 курс) / Л.В. Примак, А.А. Москаленко. – Київ, 2023. – 68 с.
- ✓ Methodologiacal guideline for education practice of discipline з дисципліни «Geoinformatics, informatics and programming» (1 курс) / А.А. Москаленко, О.М. Шикула, І.М. Шквир. – Київ, 2022. – 64 с.
- ✓ Конспект лекцій з дисципліни «Геоінформатика». Частина 1 (для студентів напрямку підготовки «Геодезія, картографія та землеустрій») / О.М. Шикула, І.М. Шквир, А.А. Москаленко,Т.А. Гезь. – Київ, 2015. – 241 с.
- ✓ Конспект лекцій з дисципліни «Геоінформатика». Частина ІІ (для студентів напрямку підготовки «Геодезія, картографія та землеустрій») / О.М. Шикула, І.М. Шквир, А.А. Москаленко. – Київ, 2015. – 305 с.
- ✓ Конспект лекцій з дисципліни «Геоінформатика». Частина ІІІ (для студентів напрямку підготовки «Геодезія, картографія та землеустрій») / О.М. Шикула, О.П. Дроздівський, І.М. Шквир, А.А. Москаленко. – Київ, 2015. – 162 с.
- ✓ Курс лекцій з дисципліни «Інформатика і програмування» (для студентів напрямку підготовки «Геодезія, картографія та землеустрій» скорочений термін навчання) / О.М. Шикула, І.М. Шквир, А.А. Москаленко, Т.А. Гезь, Н.М. Назаренко. – Київ, 2014. – 128 с.
- ✓ Методичні вказівки до виконання самостійної роботи з дисципліни «Інформатика і програмування» (для студентів напрямку підготовки «Геодезія, картографія та землеустрій» скорочений термін навчання) / О.М. Шикула, І.М. Шквир. – Київ, 2013. – 16 с.
- ✓ Методичні вказівки до виконання самостійної роботи з дисципліни «Інформатика і програмування» (для студентів напрямку підготовки «Геодезія, картографія та землеустрій») / О.М. Шикула, І.М. Шквир. – Київ, 2013. – 32 с.

10.   Recommended sources of information
Basic:

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 p.

2. Bolstad P., Manson S. GIS Fundamentals: A First Text on Geographic Information System. 7th Edition. 2022. 764 p.

3. Павлиш В. А., Гліненко Л. К., Шаховська Н. Б.. Основи інформаційних технологій і систем. Львів: Львівська політехніка. 2018. 620с.

4. Карпінський Ю.О., Лященко А.А., Лазоренко Н.Ю., Кінь Д.О. Основи створення інтероперабельних геопросторових даних. Київ. КНУБА. 2023.302 с.

Addition:

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 p.

7. Еллен Лаптон, Дженніфер Коул Філліпс. Графічний дизайн. Нові основи. Київ: ArtHuss. 2019. 262 с.

8. Берінато С. Хороші діаграми. Поради, інструменти та вправи для кращої візуалізації даних. Київ: ArtHuss. 2022. 288 с.

9. Марк Лутц. Python. Довідник програміста. Київ: Науковий світ. 2023. 294 с.

10. Пол Беррі. Head First. Python: Легкий для сприйняття довідник. Харків: 2021. 624 с.

11. Шипулін В. Д. Основні принципи геоінформаційних систем: навчальний посібник. Харків: ХНАМГ, 2010. 313 с.

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. Довідник з мови Python. 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

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

The head of the academic council _____Taras IEVSIUKOV