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, INFORMATICS AND PROGRAMMING

Area of knowledge	G "Engineering, Manufacturing and Construction"
Specialty	G18 Geodesy and land management
Academic programme	"Geodesy and Land Management"
Faculty	Land Management
Developed by:	Assistant Professor, PhD, Bohdanna ZAYACHKIVSKA Assistant Professor, Doctor of Philosophy Anastasiia Gorodnycha

Kyiv – 2025

Description of the course Geoinformatics, Informatics and Programming

Tasks of discipline are 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.

Branch of knowledge, direction of education, specialty, educational-qualification level (EQL)	
Educational qualification level	Bachelor
Specialty	G "Engineering, Manufacturing and Construction"
Educational program	Geodesy and Land Management
Description of the course	
Type	Compulsory
Total number of hours	120
Number of credits ECTS	4
Number of content modules	4
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
Semester	1-2
Lectures	15-15
Practical, seminars	-
Laboratory studies	30-30
Self-dependent work	15-15
Number of weekly hours for full-time study: classroom	2-2

1. Aim, competencies and program outcomes of the academic discipline

Aim of the discipline “Geoinformatics, Informatics and Programming” is to form in the specialist an awareness of the prospects for the development and further practical use of computer technologies, theoretical knowledge and practical skills of working on a computer in word and spreadsheet processors , writing programs using the Python programming language , working with files and file systems, acquiring skills in a systematic approach to learning, building algorithms of actions, automating calculations and working with information in general and search engines.

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.

***- expected learning outcomes (ELO)*:**

ELO2. Organize and manage the professional development of individuals and groups.

ELO3. Communicate information, ideas, problems, solutions, personal experience and arguments to specialists and non-specialists.

ELO4. 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.

ELO9. 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.

ELO10. 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.

ELO11. 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.

ELO15. 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.st.		l	p	lab	ind
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**					
Total hours		**120**					**30**					

3. **Lecture topics**

No. salary	Topic name	Number hours
1 semester		
1	Topic 1. Theoretical prerequisites for studying geoinformatics	2
2	Topic 2. Modern technical means of working with data	2
3	Topic 3. Digital Transformation	2
4	Topic 4. Using word processors when performing land surveying work	2
5	Topic 5. Working with tables in word processors	2
6	Topic 6. Working with graphic objects in word processors	2
7	Topic 7 Working with scientific and technical documentation	3
2nd semester		
1	Topic 1 (8). Using spreadsheets in land surveying	2
2	Topic 2 (9). Working with formulas and functions in spreadsheets	2
3	Topic 3 (10). Data visualization in the form of diagrams using spreadsheets	2
4	Topic 4 (11). Modern programming languages. Basic syntax of Python	2
5	Topic 5 (12). The concept of control structures in programming. Functions	2
6	Topic 6 (13). Working with complex data types	2
7	Topic 7 (14). Working with files	3

4. Laboratory 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 word processor	2
9	Working with tables in word processor	2
10	Work with simple graphic images in the form of flowcharts in text documents	2
11	Working with graphics in word processor	2
12	Work with the formula editor and elementary calculations in word processor	2
13	Work with links and footers in word processor	2
14	Document review in word processor	2
15	Hyperlinks and macros	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 table processor spreadsheet	2
2 (17)	Formatting and editing the table structure in table processor	2
3 (18)	Conditional formatting of table cells	2
4 (19)	Work with formulas in the table processor	2
5 (20)	Working with sheets in the table processor, exchanging data between sheets	2
6 (21)	Table processor: work with diagrams	2
7 (22)	Table processor: 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***
Total		**90**

5. Self-dependent work

№	Topic	Hours
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

6. Methods and means of diagnosing learning outcomes:

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

7. 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).

8. Assessment of learning outcomes.

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

8.1. Distribution of points by types of educational activities

Topic	Learning outcomes	Evaluation
First semester		
Module 1. INFORMATION TECHNOLOGIES IN GEODESY AND LAND MANAGEMENT		
Laboratory work 1. Working in the Windows environment. Basic actions with files and folders	PRN2, 3, 4, 9. Including the prerequisites for the development of computer science as a science and the basic techniques of working in the Windows environment. Apply practical skills in creating, copying, moving, deleting, restoring, searching and archiving files and documents. Be able to use various types of cloud environments for storing significant amounts of information.	**15**
Laboratory work 2. Moodle University distance learning information system. Part 1	PRN2, 3, 4, 9, 10, 11, 15. Including the principles of the functional construction of a computer as a technical means of working with data	**10**
Laboratory work 3. Moodle University distance learning information system . Part 2	PRN2, 11, 15. Including the ability to work with various distance learning systems using a personal computer. Analyze the features of the hardware of computer networks	**10**
Laboratory work 4. Moodle University distance learning information system. Part 3	PRN4, 9, 10, 11, 15. Including to know the main elements of the operating system interface, as well as the features of decision-making, to be able to form concepts about PC software and its structure.	**15**
Laboratory work 5. Working with antivirus programs	PRN4, 10, 11. Including analyzing a file and file system, the full path to a file, and applying practical skills in working with antivirus software.	**10**

Independent work 1. Working with Google Drive data storage		**10**
Modular control		**30**
Together by content module 1		**100**
Module 2. PROCESSING OF LAND INFORMATION IN WORD PROCESSORS		
Laboratory work 6. Editing and formatting text. Part 1	PRN2, 3, 4, 9, 10, 11, 15. Including the purpose and main tasks of application software packages, such as Microsoft Office, as well as the test processor.	**5**
Laboratory work 7. Editing and formatting text. Part 2	PRN2, 3, 9. Including the ability to configure the interface and set parameters for working with the word processor	**5**
Laboratory work 8. Entering special characters in a word processor	PRN2, 10,11. Apply practical skills in editing and formatting text in a word processor, as well as entering special characters	**10**
Laboratory work 9. Working with tables in a word processor	PRN2, 3, 4, 9, 15. Know the capabilities of a spreadsheet processor for creating, editing, and formatting tables of various structures, be able to create and insert tables into a document, edit and format tables, sort data in tables, and perform basic calculations in them, highlight additional features for working with tables: headers, automatically adding captions to a table, creating a list of tables, etc.	**10**
Laboratory work 10. Working with simple graphic images in the form of flowcharts in text documents	PRN2, 3, 11, 15. Including the capabilities of a word processor to create special templates, flowcharts, diagrams, graphs and place graphic objects in a text editor	**10**
Laboratory work 11. Working with graphics in a word processor	PRN2, 3, 4, 15. Be able to select, place various layouts of graphic objects , edit, format graphic objects, in particular create, edit your own block diagrams	**10**
Laboratory work 12. Working with the formula editor and elementary calculations in a word processor	PRN2, 3, 9, 11. Apply practical skills in creating templates and forms, as well as links on the page, as well as forming a list of used literature	**5**
Laboratory work 13. Working with links and headers in a word processor	PRN2, 3, 9, 11. Know the basic methods for creating formulas, headers and footers	**5**
Lab 14. Reviewing a document in a word processor	PRN2, 3, 4, 9, 10, 11, 15. Be able to perform simple calculations in tables in the MS Word text editor, as well as edit headers and footers,	**5**
Laboratory work 15. Hyperlinks and macros	PRN2, 3, 9, 11. Including being able to link information within one document or with other documents, including those of different formats, and automate actions	**5**
Modular control		**30**
Together by content module 2		**100**
Only for 1 semester		**70**
Test		**30**
2nd semester		
Module 1 (3). PROCESSING OF LAND-BASED INFORMATION IN SPREAD PROCESSORS		

Laboratory work 1. Creating spreadsheets and entering data in a spreadsheet processor Independent work 1. Drop-down lists of the spreadsheet processor , conditional formatting of cells by values	PRN2, 4, 9, 10, 11, 15. Including the purpose and main tasks of application packages, in particular Microsoft Office, as well as a spreadsheet	**10** **5**
Laboratory work 2. Formatting and editing the structure of tables in a spreadsheet	PRN2, 3, 4, 9, 10. Including applying practical skills in creating, copying, moving, deleting, restoring, searching, and archiving workbooks.	**10**
Laboratory work 3. Conditional formatting of table cells	PRN2, 3, 4, 9. Including being able to create, edit, and format books in a spreadsheet	**10**
Laboratory work 4. Working with formulas in a spreadsheet	PRN2, 3, 4. Including the elements and composition of a formula, absolute and relative references to cells in a spreadsheet , the ability to create and edit formulas in a spreadsheet	**10**
Laboratory work 5. Working with sheets in a spreadsheet , exchanging data between sheets	PRN2, 3, 4, 9. Analyze the features copying formulas in a spreadsheet	**10**
Laboratory work 6. Working with charts in a spreadsheet	PRN2, 3, 4, 9. Apply formulas when calculating the monetary valuation of land plots in a spreadsheet processor	**5**
Laboratory work 7. Creating value distribution diagrams in a spreadsheet	PRN2, 3, 4, 9, 10, 11, 15. Including the types of diagrams and the features of their use for visualizing numerical data , be able to choose the type and build diagrams in a spreadsheet, analyze the presentability of a diagram when visualizing numerical data, apply practical skills in working with diagrams in a spreadsheet	**10**
Modular control		**30**
Together by content module 1		**100**
Module 2 (4). PROCESSING OF LAND INFORMATION USING HIGH-LEVEL PROGRAMMING LANGUAGES		
Laboratory work 8. Fundamentals of programming in Python	PRN2, 3, 4, 9, 10, 11, 15. Including the classification of programming languages, the general structure of a program in the Python programming language	**5**
Laboratory work 9. Program structure, data, expressions and operations in Python	PRN2, 3, 4, 9. Including the ability to create an elementary program in Python using mathematical operators, built-in functions, and outputting the result to the console.	**10**
Laboratory work 10. Programming functions in Python	PRN2, 3, 4, 10, 11. Including applying practical skills in Python to process angular and metric measurements.	**10**

Laboratory work 11. Conditional and cyclic flow control structures in the Python programming language	PRN10, 11, 15. Including the classification of control structures, the syntax of cyclic and conditional structures, functions in Python	**10**
Lab 12. Lists and tuples (records) in Python	PRN10, 11, 15. Including the ability to program your own functions in Python , perform cyclic and conditional operations in the program. , use programming to convert degrees of angles to decimal and vice versa, to perform verification of entered variables.	**10**
Laboratory 13. Arrays in Python	PRN2, 3, 4, 9, 10, 11, 15. Including definitions of lists, records, dictionaries, sets in Python	**10**
Lab 14. Dictionaries and working with files in Python	PRN2, 3, 4, 9, 10, 11, 15 Including the ability to choose the type of complex data depending on the task, program the input, recording and output of complex data types , apply practical programming skills using complex data types when working with large amounts of information	**5**
Laboratory work 15. Date and time objects in Python Independent work 2. Maps.visicom.ua – Ukrainian geospatial data portal	PRN2, 3, 4, 9, 10, 11, 15. Including understanding the classification of files into text and binary, Python syntax when working with files, being able to open, write to, and close files in a Python program , calculating program runtime, and applying programming skills to output results to a file when working with large amounts of information.	**5** **5**
Modular control		**30**
Together by content module 2		**100**
Total for the second semester		**70**
Exam		**30**

9. Teaching and learning aids:

- 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.
- Методичні рекомендації до виконання лабораторних робіт з дисципліни "Геоінформатика, інформатика й програмування. Частина 2" для студентів ОС «Бакалавр» спеціальності 193 "Геодезія та землеустрій" / Л.В. Примак, А.А. Москаленко, Б.Б. Заячківська, - К., ЦП «КОМПРИНТ», 2024, 138 с.
- Методичні рекомендації до виконання лабораторних робіт з дисципліни "Geoinformatics, Informatics and programming. Part 2" англійською мовою для студентів ОС «Бакалавр» спеціальності 193 "Геодезія та землеустрій" / Л.В. Примак, А.А. Москаленко, Б.Б. Заячківська, - К., ЦП «КОМПРИНТ», 2024, 140 с.
- Конспект лекцій з дисципліни "Геоінформатика, інформатика й програмування. Частина 2" для студентів ОС «Бакалавр» спеціальності 193 "Геодезія та землеустрій" / Л.В. Примак, О.П. Дроздівський, Б.Б. Заячківська, - К., ЦП «КОМПРИНТ», 2024, 167 с.
- Конспект лекцій з дисципліни "Geoinformatics, Informatics and programming. Part 2" англійською мовою для студентів ОС «Бакалавр» спеціальності 193 "Геодезія та землеустрій" / Л.В. Примак, О.П. Дроздівський, Б.Б. Заячківська, - К., ЦП «КОМПРИНТ» 2024, 165 с.
- program of teaching practice of the academic discipline

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.

Addition:

4. 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.
5. Alexander M., Kusleika D. Microsoft Excel 365 Bible. Wiley 2022. 1072 p.
6. Еллен Лаптон, Дженніфер Коул Філліпс. Графічний дизайн. Нові основи. Київ: ArtHuss. 2019. 262 с.
7. Берінато С. Хороші діаграми. Поради, інструменти та вправи для кращої візуалізації даних. Київ: ArtHuss. 2022. 288 с.
8. Марк Лутц. Python. Довідник програміста. Київ: Науковий світ. 2023. 294 с.
9. Пол Беррі. Head First. Python: Легкий для сприйняття довідник. Харків: 2021. 624 с.
10. Шипулін В. Д. Основні принципи геоінформаційних систем: навчальний посібник. Харків: ХНАМГ, 2010. 313 с.
11. Moodle Documentation. URL: https://docs.moodle.org/403/en/Main_page
12. Word help & learning. URL: https://support.microsoft.com/en-us/word
13. Excel help & learning. URL: https://support.microsoft.com/en-us/excel
14. Довідник з мови Python. URL: https://docs.python.org/uk/3/reference/index.html
15. Online IDE - Code Editor, Compiler, Interpreter. URL: https://www.online-ide.com/