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
«18» May 2023

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

"REVIEWED"
Program Coordinator
I.P. Kovalchuk.

PROGRAM OF THE COURSE

GEOINFORMATICS, INFORMATICS AND PROGRAMMING

Specialization	193 Geodesy and Land management
Educational program	"Geodesy and Land Management"
Faculty	Land Management
Developers	Associate prof., PhD, Drozdivskyi O.P.

Kyiv – 2023

1. 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
Independent work	15-15-15
Individual tasks	-
Number of weekly hours for full-time study: classroom	2-2-2

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

Aim of the discipline: The course provides the ability to use computer technology experts 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.

The discipline provides the formation of a number 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.

SC05. Ability to use modern information, technical and technological support to solve complex issues 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.

3. Program of the discipline

Modules and topics	weeks	Total	1	p	lab	ind	s.w.	Total	л	п	лаб	інд
Hours												
full-time study								**correspondence**				
	weeks	Total	weeks					Total	weeks			
			1	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**				

4. Topics of seminars

№	Topic	Hours

5. Topics of practical classes

№	Topic	Hours

7.   Topic of laboratory classes

№	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

8. 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

9. Control Questions

Content module 1

1. Define information.
2. What is studying computer science?
3. Which classes shared information?
4. What are the units of information?
5. What is the carrier of information?
6. What are the types of information?
7. The concept of information system.
8. Move the block diagram of a computer.
9. Describe the basic principles of computer (von Neumann principles).
10. What does RAM?
11. What information is stored in permanent memory?
12. What is cache?
13. What does the CPU?
14. What are the main characteristics of the processor?
15. What are the types of printers?
16. What are the main features of the monitor?
17. The concept of encoding information.
18. How will the information is in the computer?
19. Principles of encoding text information.

20. What code graphic information?
21. How is color-coded?
22. Define the concept of a file.
23. What are the components of the file name?
24. What does the operating system?
25. What is the shell? Give examples.
26. What programs relating to the application? Give examples.
27. What are the translators?
28. What is included in the software package Microsoft Office? <u>Content module 2</u>
29. What does the text editor?
30. Purpose and functionality of Microsoft Word.
31. What are the main characters of the formatting in Microsoft Word?
32. What are the basic paragraph formatting options in the program Microsoft Word?
33. What do you know page formatting options in the program Microsoft Word?
34. What is the method of entering text in a text editor Microsoft Word?
35. What are the basics of creating documents in Microsoft Word?
36. The concept of a template to use it. Template Normal.
37. The concept of the table. The main ways to create tables in Microsoft Word.
38. Formatting tables.
39. What operations can be performed with fragments of a text editor Microsoft Word?
40. What is the list? Species lists.
41. Formatting Lists in Microsoft Word.
42. What types of images are used in Microsoft Word?
43. What the picture can be placed in relation to the text in Microsoft Word? <u>Content module 3</u>
44. Purpose and main functions of the program Microsoft Excel.
45. What can I do with a worksheet in Microsoft Excel?
46. Types of addressing the program Microsoft Excel.
47. What are the data types used in Microsoft Excel?
48. The concept of formulas and functions in Microsoft Excel.
49. Using formulas in Microsoft Excel.
50. How to build a chart in Microsoft Excel?
51. What are the types of diagrams that are used in Microsoft Excel, and define its scope.
52. The data analysis in Microsoft Excel.
53. Use the filters in an environment Microsoft Excel.
54. Concept of programming language. Classification of programming languages.
55. What is an algorithm? Its properties. Ways of presenting the algorithm.
56. Basic structures of algorithms. Their main properties.
57. Purpose of the Python programming system
58. Basic concepts of the Python programming system
59. Basic elements of the Python programming system
60. Geographic tasks.
61. The concept of geoinformatics.
62. Movement of geographic information in geoinformatics.
63. Connection of geoinformatics with geography, geodesy, mathematics and informatics.
64. Spatial ability and spatial thinking: definition of concepts.
65. Functions of spatial thinking.
66. Elements of spatial thinking.
67. Spatial thinking and spatial literacy: definition of concepts.
68. Competences of spatial thinking.
69. The pyramid of general competencies in the field of geoinformatics.
70. Domains of geographic information: list, short definitions.
71. Length, dynamism, structure, discreteness as characteristics of geographical space.
72. Mathematical characteristics of geographic space.
73. Absolute location in space, example

74. Relative location in space, examples
75. Dimensionality (dimensionality) of space.
76. Dimensionality (dimensionality) of space on the example of Google Earth Pro.
77. Image spatial resolution and image resolution: common features.
78. Time as a domain of geographic information.
79. Time measurement.
80. Clear and fuzzy representation of time.
81. Static, oscillatory, chaotic and stochastic time patterns.
82. Geometric primitives: concepts and examples.
83. Geometric primitives in Google Earth Pro.
84. Maps.visicom.ua - Ukrainian geospatial data portal.
85. The concept of geoinformatics.
86. What are the types of geographical tasks?The concept of a geoinformatics.
87. Geoinformatics Research
88. Geographic information science
89. Geographical information systems
90. Geoinformatics and digital earth initiatives
91. International Cartographic Association
92. International Society for Photogrammetry and Remote Sensing

10.   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.

11.   Forms of control

The main methods of control of knowledge and skills students have to study the subject 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.

12. Ratio between national and ECTS values and rating from the discipline

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)

National value	Rating, points
EXCELLENT	90-100

GOOD	74-89
SATISFACTORY	60-73
UNSATISFACTORY	0-59

Student's rating of course mastering R_{course} it is determined in points and made 100 points. Course ratings calculate as: $R_{COURSE}=R_{EDU}+ R_{Final\ Test}$ (Course ratings = Education work rating + Final Test Rating)

70% (70 points) of the R_{COURSE} is the R_{EDU} 30%
(30 points) of the R_{COURSE} is the $R_{Final\ Test}$.
R_{COURSE} equal 100 points (100 %).

Ratings of education work consist of attending a lecture, mastering of theoretical material, executing and passing laboratory works, and control theoretical knowledge.

$$R_{EDU}=R_{Lect}+R_{Lab}+R_{Self}+R_{Contr.}$$

Evaluation criteria for an attending of a lecture R_{Lect}

Student will have a **maximal grade** for an attending a lecture, if he/she presents on a lecture, participates actively in the discussion of theme of lecture, answer a lecturer question, gives examples, assiduously conducts the compendium of lecture.

Student will have a **minimum (sufficient) grade (0,6 to maximal)** for a lecture, if he/she is late for the lecture less than 5 minutes, inattentive (but keeps discipline), passive in discussion of theme, doesn't give examples, but can formulate basic concepts of a lecture. Student will have a **0,6 grade**, if he/she didn't appear on a lecture <u>with reasonable excuse</u>, but has conducts the compendium of lecture and can formulate the basic concepts of lecture.

Student will have **grade from 0 to minimum**, if he/she is late for the lecture more than 5 minutes, can't define the basic concepts of lecture, but has the compendium of lecture, inattentive (but keeps discipline).

If student skipped lecture <u>with reasonable excuse</u> and doesn't have the compendium of lecture, student will have **grade equal 0.**

If student skipped lecture <u>without reasonable excuse</u>, disturbs discipline, doesn't have the compendium of lecture, student will have penalty grade**.**

Evaluation criteria for the mastering control of theoretical materials $R_{Contr.}$

The written work has a **maximal grade**, if it has written answer to the questions contained in the examination card. Answer should be in the compressed form, logically and consistently, contains a definitions, basic descriptions, principles and receptions of implementation, charts, examples, the indicated application domain in speciality area, etc.

The written work has a **minimal grade (0,6 to maximal)**, if it has main definition and descriptions, indicates principles and receptions of implementation, gives some examples, etc and gives written answer (even inexact) to all questions contained in the examination card.

Rating for laboratory work R_{LAB}

Student will have a **maximal grade** for fulfillment of a laboratory work, if he/she presents on a lesson, participates actively in implementation of laboratory work, executes the task fully and gets the expected result, can explain a logical sequence and phased of actions, answers a control questions of teacher.

Student will have a **minimum (sufficient) grade (0,6 to maximal)** for a laboratory work, if he/she is late for the lesson less than 5 minutes, inattentive (but keeps discipline), executes the task fully, but with some teacher help, and gets the expected result, gives insufficient answer a control questions of teacher.

Student will have **grade from 0 to minimum**, if he/she executes the task partly, (but executes the task more than 75%), or doesn't get the expected result, gives inexact answer.

If student skipped laboratory work <u>with reasonable excuse</u>, student has to rework this lesson in other time. Student should arrange time with a teacher, because task uses license software.

If student skipped laboratory work <u>without reasonable excuse</u> or didn't finish task in the set time, student gets a penalty.

Rating for self-work R_{Self}

Student will have a **maximal grade** for defence of a self-work, if he/she clear define a theoretical grounds of the topic, gives examples, can account for the sequence of actions implementation, can apply theoretical knowledges in practice.

Student will have a **minimum (sufficient) grade (0,5 to maximal)** defence of a self-work, if he/she gives insufficient answer, doesn't give examples or gives one with complication.

Student will have **grade from 0 to minimum** for defence of a self-work, if he/she gives inexact answer, doesn't give main definitions.

Rating of additional work R_{add} and rating of penalty $R_{penalty}$ has an influence on rating of educational work.

Maximal rating of additional work makes 10% from rating of course (that is 10 points). It's determined by a lecturer. Rating of additional work given to student after department decision for implementation of work, that don't foreseen by a working curricula of the course, but increase student's level of skill.

5% (4 points) of the rating of education work is rating of penalty. Rating of penalty has negative quantity and it decreases rating of education work. Rating of penalty was determined by a lecturer. It's entered department decision for a student, who was mastering material of the module too late, wasn't following the executive schedule and had omitted lesson from time to time, etc.

Students have to have more than 60 % points from rating of educational work for admitting to final test. It's meaning, that student should to do next minimal list of work: • to execute all laboratory works;

• to don't get punitive measure of lecturer.

Rating evaluation of the final test is proposed as a test tasks.

Distribution of value points for performing various learning activities of each module

	Type	Module				Course	
		Point by work	Percent by		Total points	Semester	
			work	module		% by module	total
Semester I							
Module № 1	Laboratory work #1	100	15				
	Laboratory work #2	100	15				
	Laboratory work #3	100	10	70	100	25	
	Laboratory work #4	100	10				
	Laboratory work #5	100	10				
	Indiwidual work№ 1	100	10				
	Module control	100	30	30			
Module № 2	Laboratory work #6	100	5				100
	Laboratory work #7	100	10				
	Laboratory work #8	100	5				
	Laboratory work #9	100	10				
	Laboratory work #10	100	10				
	Laboratory work #11	100	10	70	100	45	
	Laboratory work #12	100	5				
	Laboratory work #13	100	5				
	Laboratory work #14	100	5				
	Laboratory work #15	100	5				
	Module control	100	30	30			
Final test		100				30	
Semester II							
Module № 1 (3)	Laboratory work #1 (16)	100	5				
	Laboratory work #2 (17)	100	10				
	Laboratory work #3 (18)	100	10				
	Laboratory work #4 (19)	100	10	70	100	35	100
	Laboratory work #5 (20)	100	10				
	Laboratory work #6 (21)	100	10				
	Laboratory work #7 (22)	100	10				
	Indiwidual work№ 1 (2)	100	5				

	Module control	100	30	30				
Module № 2 (4)	Laboratory work #8 (23)	100	5		70	100	35	
	Laboratory work #9 (24)	100	10					
	Laboratory work #10 (25)	100	10					
	Laboratory work #11 (26)	100	10					
	Laboratory work #12 (27)	100	10					
	Laboratory work #13 (28)	100	10					
	Laboratory work #14 (29)	100	10					
	Laboratory work #15 (30)	1000	5					
	Module control	100	30	30				
Exam		100					30	
Semester III								
Module № 1 (5)	Laboratory work #1 (31)	100	5		70	100	30	100
	Laboratory work #2 (32)	100	10					
	Laboratory work #3 (33)	100	10					
	Laboratory work #4 (34)	100	10					
	Laboratory work #5 (35)	100	10					
	Laboratory work #6 (36)	100	10					
	Laboratory work #7 (37)	100	10					
	Indiwidual work№ 1 (3)	100	5					
	Module control	100	30	30				
Module № 2 (6)	Laboratory work #8 (38)	100	5		70	100	40	
	Laboratory work #9 (39)	100	10					
	Laboratory work #10 (40)	100	10					
	Laboratory work #11 (41)	100	10					
	Laboratory work #12 (42)	100	10					
	Laboratory work #13 (43)	100	10					
	Laboratory work #14 (44)	100	5					
	Laboratory work #15 (45)	100	10					
	Module control	100	30	30				
Exam		100					30	

13. Methodological Support

1.   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.

2.   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.

3.   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.

4.   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.

5.   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.

6.   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.

14. Recommended literature Basic

Basic:

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

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

3.   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.

4.   Alexander M., Kusleika D. Microsoft Excel 365 Bible. Wiley 2022. 1072 p.

Addition

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

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

3.   Пол Беррі. Head First. Python: Легкий для сприйняття довідник. Харків: 2021. 624 c.

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

14. Information resources:

1.   Електронний навчальний курс URL: http://elearn.nubip.edu.ua/course/view.php?id=705

2.   Електронний навчальний курс URL: http://elearn.nubip.edu.ua/course/view.php?id=706

3.   Електронний навчальний курс URL: http://elearn.nubip.edu.ua/course/view.php?id=707

4.   Електронний навчальний курс URL: http://elearn.nubip.edu.ua/course/view.php?id=2436

5.   Електронний навчальний курс URL: http://elearn.nubip.edu.ua/course/view.php?id=2437

6.   Електронний навчальний курс URL: http://elearn.nubip.edu.ua/course/view.php?id=2438

7.   Moodle Documentation. URL: https://docs.moodle.org/403/en/Main_page

8.   Word help & learning. URL: https://support.microsoft.com/en-us/word

9.   Excel help & learning. URL: https://support.microsoft.com/en-us/excel

10.   Довідник з мови Python. URL: https://docs.python.org/uk/3/reference/index.html

11.   Online IDE - Code Editor, Compiler, Interpreter. URL: https://www.online-ide.com/

12.   Google Earth Help. URL: https://support.google.com/earth/?hl=en#topic=7364880

13.   QGIS User Guide. URL: https://docs.qgis.org/3.28/en/docs/user_manual/index.html