

Department of Geoinformatics and Aerospace Research of the Earth

"CONFIRMED"
Dean of the Faculty of Land management

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"APPROVED"
at the meeting of the department of Geoinformatics
and Aerospace Research of the Earth
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A.i. head of Department
O. P. Drozdivskyi

"REVIEWED"
Program Coordinator
A. G. Martyn

PROGRAM OF THE COURSE

GIS IN CADASTRAL SYSTEMS

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., Associate prof., Koshel A.O.</u>
	<u>Associate prof., PhD, Moskalenko A.A.</u>

1. Description of the discipline
GIS in cadastral systems

Branch of knowledge, direction of education, specialty, educational-qualification level (EQL)		
Educational-qualification level	Master	
Specialty	193 Geodesy and Land management	
Educational program	Geodesy and Land management	
Discipline characteristics		
Type	Normative	
Total hours	120	
ECTS credits	4,0	
Thematic modules	2	
Course project (work) (if exist)		
type of examination	Exam	
Discipline parameters for full-time students and students studied by correspondence		
	full-time study	by correspondence
year of training	2	
semester	3	
lectures	- hours	
practical, seminar	- hours	
laboratory	30 hours	
self-dependent work	90 hours	
individual work	- hours	
amount of self-dependent work per week, hours	3 hours	

2. Мета і завдання навчальної дисципліни / Purpose and tasks of the discipline GIS in cadastral systems

Discipline "GIS in cadastral systems" provides the opportunity to use for the national cadastral system and land management software and hardware for automated accounting, storage, display, analysis, modeling of spatially coordinated information.

Aim of the discipline is learning and gaining master students and acquire the necessary theoretical knowledge and practical skills in the use of geographic information systems in creating cadastral systems and the formation of knowledge about the development of cadastral systems of Ukraine and the world, the contribution of Ukrainian and foreign scientists.

Tasks of discipline is forming the specialist and subsequent practical use of technologies of GIS in land management and land cadaster to take stock of land resources and land owners predicting the state land fund, monitor the use and protection of soil, registration and protection of the rights of citizens and businesses and more.

The discipline provides the formation of a number of competencies:

Integral competencies

The ability to solve complex specialized tasks and practical problems during professional activity in the field of geodesy and land management or during the training process, which involves the application of theoretical knowledge and methods of geodetic, photogrammetric, geoinformation, cartographic technologies and systems, and real estate cadastre and valuation.

- general competencies:

GC 2. Ability to learn to absorb the acquired knowledge in the field of geodesy, photogrammetry, land management, State Land Cadastre, land and real estate valuation, cartography and geoinformatics and integrate them with existing ones.

GC 4. Ability to plan and manage time.

GC 5. Ability to produce new ideas, show creativity and ability to think systematically.

GC 7. Be security-oriented.

GC 8. Ability to have a flexible way of thinking that allows you to understand and solve problems and problems, while maintaining a critical attitude to established scientific concepts.

GC 9. Ability to apply knowledge in practice.

GC 10. Have research skills.

GC 11. Have skills in project development and management.

GC 12. Ability to work both individually and in a team.

GC 13. Ability to communicate effectively at the professional and social levels.

- special competencies:

SC 2. Knowledge of basic regulations and reference materials, current standards and specifications, instructions and other regulatory documents in professional activities;

SC 6. Knowledge of modern technological processes and systems of technological preparation of production;

SC 7. Ability to apply and integrate knowledge and understanding of disciplines of related engineering fields;

SC 11. Ability to use knowledge and skills to calculate the a priori assessment of accuracy and choice of technologies for the design and implementation of applied professional tasks;

SC 13. Ability to investigate the problem and identify constraints, including those related to the problems of sustainable development and environmental impact;

SC 14. Ability to argue the choice of methods for solving specialized problems, critically evaluate the results and defend decisions;

SC 15. Use of appropriate terminology and forms of expression in professional activities.

learning results:

KU 3. Knowledge and understanding of the theoretical foundations of geodesy, higher and engineering geodesy;

KU 4. Knowledge and understanding of the theoretical foundations of topographic and thematic mapping, compilation and updating of maps, remote sensing of the Earth and photogrammetry;

KU 5. Knowledge and understanding of the theoretical foundations of land management, real estate valuation, registration system and the State Land Cadastre;

KU 6. Knowledge and understanding of the basics of the legal framework for ensuring the rational use, protection, accounting and evaluation of land at the national, regional, local and economic levels;

KU 8. Knowledge and understanding of methods and technologies of creation of state geodetic networks and special engineering-geodetic networks, topographic surveys of the area, topographic and geodetic measurements for survey;

KU 9. Knowledge and understanding of design, construction and operation of engineering structures, public, industrial and agricultural complexes using modern ground and aerospace methods;

AKU 10. Application of knowledge and understanding for the use of basic methods of collecting information in the field of geodesy and land management, its systematization and classification in accordance with the design or production task;

AKU 11. Application of knowledge and understanding of the use of geodetic and photogrammetric equipment and technology;

AKU 12. Application of knowledge and understanding of methods of mathematical processing of geodetic and photogrammetric measurements;

AKU 14. Application of knowledge and understanding of land use planning and protection, cadastral surveys and maintenance of the State Land Cadastre;

AKU 15. Application of knowledge and understanding on the development of land management projects, land management and cadastral documentation and land valuation documentation;

AKU 16. Application of knowledge and understanding of map development and cadastral data collection using computer technology, geographic information systems and digital photogrammetry;

AKU 17. Application of knowledge and understanding of processing the results of geodetic measurements, topographic and cadastral surveys, using geographic information technologies and computer software and database management systems;

FJ 18. Formation of judgments on the main technologies and methods of planning and execution of geodetic, topographic and cadastral surveys;

FJ 19. Formation of judgments on computer processing of survey results in geographic information systems;

FJ 23. Formation of judgments on the sale of topographic and land management products based on the use of knowledge of the basics of legislation and production management.

3. Program and structure of the course

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	
SEMANTIC MODULE I. Experience of cadastral projects regional and national level by using GIS technology													
Theme 1. GIS - technology in land cadaster. Automated land cadaster in Ukraine.	1-2	34	0		6		28						
Theme 2. Features of cadastral systems in foreign countries.	3-4	26	0		8		18						
Total by Semantic module 1		60	0		14		46						
SEMANTIC MODULE II. Object Model of cadastral database													
Theme 3. Concepts of cadastral database	5-6	18	0		4		14						
Theme 4. Data on the land fund and its displaying	7-8	21	0		6		15						
Theme 5. Server GIS	9-10	21	0		6		15						
Total by Semantic module 2		60	0		16		44						
Усього годин		120	0		30		90						

4. Seminar topics

№	Topic	Hours

5. Practical class topics

№	Topic	Hours

6. Laboratory class topics

№	Topic	Hours
1	Using GIS tools to calculate the monetary evaluation of individual plots	6
2	Construction of sanitary and coastal protection zones around objects with special regulations. Analysis zones around objects with special regulations	8
3	The selection of information from the geodatabase by location and by attributes	4
4	Data analysis using ArcGIS tools	6
5	Data analysis using ArcGIS Online tools	6
Total		30

7. Independent work topics

№	Topic	Hours
1	Professional terminology for GIS in cadastral systems	6
2	GIS - technology in land cadaster. Automated land cadaster in Ukraine.	10
3	Experience in cadastral projects regional and national levels using GIS technology	12
4	Features cadastral systems in foreign countries.	6
5	World experiences to build and use cadaster and registry	12
6	Concepts of cadastral database	4
7	Models of cadastral databases	10
8	Data on the land fund and its displaying	5
9	Use of GIS in various industries	10
10	Server GIS	5
11	Comparison of database models architecture used in cadastral systems	10
Total		90

8. Control Questions, Tests.

1. What is cadastral geodatabase?
2. What are the main classes of spatial cadastral objects of geodatabase?
3. Can you characterize the spatial data?
4. What are attributes in the geodatabase of cadastral data?
5. What are the functions of full-featured GIS?
6. What are the components of ArcInfo?
7. What are spatial tools used for working with spatial data?
8. Classification and basic properties of geoimages.
9. Comparison of representation of spatial data in ArcInfo.
10. What is a dataframes?
11. Schemes of classification in ArcInfo.
12. Transactions in vector data models.
13. The spatial queries. Building SQL-queries.
14. Raster models and classes of problems solved with their help in ArcInfo.
15. Characteristics of the base location.
16. Visualization of surfaces with layers TIN.
17. Shape files in ArcInfo.
18. What is object topology?
19. Give the comparative characteristic of GIS and other automated systems: computer aided design, automated systems research, automated reference-information systems, documentation for automated systems.
20. Describe the organization of data in GIS.
21. Spatial analysis. The types of analysis.
22. Schemes classification of geoinformation analysis.
23. Mapping characters. Methods output of the analysis. Principles of Graphic Design.
24. Expert systems to meet the challenges of GIS.
25. Baseline data models used in GIS.
26. Relational models in GIS.
27. Model "entity-relationship" in GIS.
28. The accuracy of the coordinate and attribute data in GIS.
29. Generalization in GIS.
30. Conduct and current state of the state land cadaster and land cadaster information.
31. State of SLC and land cadaster documentation.
32. Conduct automated system of land cadaster documentation.
33. The legal and organizational basis for improving maintenance of land cadaster documentation.
34. Expert systems to meet the challenges of GIS.
35. Baseline data models used in GIS.
36. Relational models in GIS.
37. The accuracy of the coordinate and attribute data in GIS.
28. Generalization in GIS systems.
39. The spatial queries. Building SQL-queries.
40. Raster models and classes of problems solved with their help in ArcInfo.
41. Characteristics of the base location.

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

The main methods of control of knowledge and skills students have to study the subject " GIS in cadastral systems " 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): $R_{dis} = R_{aw} + R_{ex}$.

Rating evaluations system of educational work for the substance modules

	Type of work	Module			Course	
		point by work	percent by		point by work	percent by
			work	module		
Module # 1	Laboratory work #1	100	20 %	70 %	100	35 %
	Laboratory work #2	100	20 %			
	Self-work	100	30 %			
	Module test / control	100	30 %	30 %		
Module # 2	Laboratory work #3	100	8 %	70 %	100	35 %
	Laboratory work #4 (part1)	100	8 %			
	Laboratory work #4 (part2)	100	8 %			
	Laboratory work #5 (part1)	100	8 %			
	Laboratory work #5 (part2)	100	8 %			
	Self-work	100	30 %			
	Module test / control	100	30 %	30 %		
Final test		100			30 %	

12. Educational and methodological support

1. Географічні інформаційні системи в кадастрових системах (методичні вказівки до виконання лабораторних робіт) – Київ: ЦП «КОМПРИНТ», 2018. – 40 с.
2. GIS in Cadastral Systems (навчально-методичний посібник) / Кохан С.С., Москаленко А.А., Кошель А.О., Дьоміна І.І.) – Київ: ЦП «КОМПРИНТ», 2020. – 88 с.

13. Recommended sources of information

3. ArcGIS for Environmental and Water Issues / William Bajjali. - 2018 - p.362
4. Мартин А.Г., Палеха Ю.М., Євсюков Т.О., Кошель А.О. Геоінформаційне забезпечення оціночного районування територій громад в Україні. Сучасні досягнення геодезичної науки та виробництва. 2022. Випуск I (43). С. 121–126.
5. Martyn A., Koshel A., Palekha Y., etc. (2020). Normative monetary valuation of land: on the way to unification and renewal of methodology. Land Management Bulletin, No. 8, 24–31
6. Геоінформаційні системи і бази даних : монографія / В. І. Зацерковний, В. Г. Бурачек, О. О. Железняк, А. О. Терещенко. – Ніжин : НДУ ім. М. Гоголя, 2014. – 492 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. Martyn A. G., Lukhograd O. M., Koshel A. O. (2017). Features of Monetary Valuation of Lands of Settlements of Ukraine in Terms of Market Relations [Text]: monograph / NULES of Ukraine. Kyiv: Comprint, 300 p.
9. Географічні інформаційні системи: Посібник/ За ред. М. Ван Мерввіна, С.С.Кохан.- К.: НАУ. 2003.-206 с.
10. Patichenko O. M. (2018). Constructive-geographical principles of normative monetary valuation of lands of settlements with the use of geoinformation technologies: abstract of the dissertation of the cand. of geogr. sciences: 11.00.11; Kyiv National University named after Taras Shevchenko. Kyiv, 20 p.
11. Національний стандарт України «ДСТУ ISO 19101:2009 Географічна інформація. Еталонна модель (ISO 19101:2002, IDT)»// 2009-10-15.
12. COU ISO 19136:2009 "Обмінний формат геопросторових даних на основі географічної мови розмітки GML (ISO 19136:2007)" // 30.09.2010
13. COU 742-33739540 0012:2010 "Комплекс стандартів База топографічних даних Правила кодування та цифрового опису векторних даних" Том 2 // 30.09.2010

Additional:

14. Основи геоінформаційних систем. Методологія. В.М.Самойленко. Навчальний посібник. –К.: Ніка-Центр.-2003.-276 с.
15. Єршов В.П., Гора І.М. Автоматизовані земельні інформаційні системи. Учбовий посібник. –К.: НАУ. 1999.- 196 с.

14. Information resources:

16. eLearn webpage - <https://elearn.nubip.edu.ua/course/view.php?id=1597>
17. ГІС рішення [Електронний ресурс]. – Режим доступу: <http://ndiasb.kiev.ua/ua/teren.php>
18. Законодавство України [Електронний ресурс]. – Режим доступу: <http://rada.gov.ua>