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
GIS IN CADASTRAL SYSTEMS

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:	Dr. Sc., Associate prof., Koshel A.O.
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Kyiv – 2025

Description of the discipline GIS in cadastral systems

The discipline provides the opportunity to use for maintaining the state land cadastre and land management software and hardware for automated accounting, storage, display, analysis, modeling of spatially coordinated information.

Branch of knowledge, direction of education, specialty, educational-qualification level (EQL)		
Educational-qualification level	*Master*	
Specialty	*G18 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*	

1. Purpose and tasks of the discipline

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. Understand the significance of GIS tools in land consolidation projects and identify various types of GIS tools that can be used. Ability to utilize GIS tools in land consolidation, such as enhancing project planning, stakeholder engagement, and decision-making processes. Collect and manage spatial data using GIS tools and understand the importance of spatial data in land consolidation projects. Utilize GIS tools to prepare maps as part of a land consolidation project and understand the role of maps in facilitating effective communication and decision-making among stakeholders involved in land consolidation.

- general competencies:

GC01. Ability to identify, formulate and solve problems;

GC04. Ability to generate new ideas (creativity);

GC05. Ability to adapt and act in a new situation.

- special competencies:

SC01. Ability to plan and perform theoretical and/or applied research, create new knowledge and technologies in the field of geodesy and land management;

SC03. Ability to effectively apply the theories, principles and technologies of mathematics, natural, technical, social, economic sciences in solving complex problems of geodesy and land management;

SC04. Ability to search for the necessary information, select and apply modern methods of processing, analysis, evaluation and publication of data, including geospatial data and metadata in solving complex problems of geodesy and land management;

SC05. Ability to substantiate and evaluate methods of surveys, surveys, tests, diagnostics, monitoring of geodesy and land management objects;

SC09. Ability to develop and apply new strategic approaches to solving problems in the field of geodesy and land management.

Programme learning outcomes:

RN03. To make effective decisions on solving applied, research and/or innovative problems in the field of geodesy and land management, analyse alternatives, make forecasts, assess risks, in particular in conditions of incomplete and/or contradictory information and ambiguous requirements;

RN04. To build and research conceptual, mathematical and computer models of objects and processes, apply them to create innovations in the field of geodesy and land management;

RN05. To create and develop geospatial data infrastructures, process and publish geospatial data and metadata related to geodesy and land management;

RN07. To justify the choice of equipment, technologies and processes for production management and research in the field of geodesy and land management and related fields;

RN09. To develop and implement measures for operational and prospective management, forecasting and planning of geodetic, cartographic and land management production, taking into account available resources and time constraints;

RN11. To perform a comprehensive analysis and assessment of the state of geodesy and land management objects and assess the consequences of the implementation of practical measures;

RN13. Perform surveys, tests, diagnostics, monitoring of geodesy and land management objects, develop land protection measures and assess their consequences;

RN14. To critically comprehend current problems and promising directions of development of geodesy and land management, related interdisciplinary issues.

2. 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 - technologies in land cadastre. Geographic information systems of land cadastre in Ukraine. Collection and management of geospatial data using GIS tools.	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. Data on the land fund and ways of displaying it. Basic concepts of cadastral database. Server-based GIS. Preparation of maps (plans) as a component of land consolidation projects.	5-6	18	0		4		14					
Theme 4. GIS tools and their importance in land consolidation projects. Different types of GIS tools and how they can be used in land consolidation.	7-8	21	0		6		15					
Theme 5. The benefits of using GIS tools in land consolidation, including their ability to improve project planning, stakeholder engagement and decision-making processes.	9-10	21	0		6		15					
Total by Semantic module 2		***60***	***0***		***16***		***44***					
Усього годин		**120**	**0**		**30**		**90**					

3. Laboratory class topics

№	Topic	Hours
1	Using GIS tools to calculate the monetary value of an individual land plot and land consolidation projects	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

4. 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

5. Means of diagnosing learning outcomes:

- exam;
- module tests;
- essays;
- protection 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**

Distribution of points received by higher education students. The assessment of higher education applicants' knowledge is based on a 100-point scale and is converted into national grades according to Table 1 of the current "Regulations on Exams and Tests in NUBiP of Ukraine"

8.1 Distribution of points by type of learning activity

Theme	Learning outcomes	Evaluation
4 semester		
MODULE 1. EXPERIENCE OF CADASTRAL PROJECTS AT REGIONAL AND NATIONAL LEVELS USING GIS TECHNOLOGIES.		
Topic 1: GIS - technologies in land cadastre. Geographic information systems of land cadastre in Ukraine. Collection and management of geospatial data using GIS tools.	RN 3,4,7,11,14 Including know modern GIS technologies in land cadastres of foreign countries. Understand geographic information systems of land cadastre in Ukraine. Understand the importance of GIS tools in land consolidation projects, distinguish and be able to apply different types of GIS tools.	35

Topic 2. Features of cadastral systems of foreign countries.	RN 3,4,5,7,9,13,14 Including understand the strengths and weaknesses of cadastral systems in foreign countries. Be able to identify the main types of cadastral systems.	35
Module control		30
Total by content module 1		100
MODULE 2. OBJECT MODEL OF THE CADASTRAL DATABASE.		
Topic 1: Data on the land fund and methods of its display. Basic concepts of cadastral database. Server-based GIS. Preparation of maps (plans) as a component of land consolidation projects.	RN 3,4,7,11,13 Including understand the concept of land fund data. Know the functions of data processing in land cadastre systems. Understand the ways of displaying data on the land fund. Be able to use GIS tools in land consolidation, e.g. to improve project planning, stakeholder engagement and decision-making processes.	30
Topic 2. GIS tools and their importance in land consolidation projects. Different types of GIS tools and how to use them in the process of land consolidation.	RN 3,4,5,7,9,11,14 Including understand the concept of a cadastral database. Know the main ways of organising cadastral databases and operations with them. Collect and manage geospatial data using GIS tools and understand the importance of geospatial data in land consolidation projects.	20
Topic 3. The benefits of using GIS tools in land consolidation, including their ability to improve project planning, stakeholder engagement and decision-making processes.	RN 3,4,5,7,9,11,13,14 Including understand the concept of server-based geographic information technologies. Know the main functions that server-based GIS can perform. Use GIS tools to prepare maps (plans) as part of a land consolidation project and understand the role of maps in facilitating effective communication and decision-making between stakeholders involved in land consolidation.	20
Module control		30
Total by content module 2		100
Total for 4 semester		70
Examination		30
Total for the course		100

8.2 Scale for assessing the knowledge of a higher education student

Rating of higher education applicants, points	Assessment according to the national system Exams/tests
90-100	відмінно
74-89	добре
60-73	задовільно
0-59	незадовільно

To determine the rating of a higher education applicant in mastering the discipline $\mathbf{R_{ДИС}}$ (up to 100 points) certification rating received (up to 30 points) is added to the rating of a higher education student for academic work $\mathbf{R_{НР}}$ (up to 70 points): $\mathbf{R_{ДИС} = R_{НР} + R_{АТ}}$.

8.3. Assessment policy

Policy on deadlines and retakes	works that are submitted late without valid reasons will be assessed with a lower grade. Modules may be retaken with the permission of the lecturer if there are valid reasons (e.g. sick leave).
Policy on academic integrity	cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct textual references to the literature used
Attendance policy	attendance is compulsory. For objective reasons (e.g. illness, international internship), training can take place individually (online in agreement with the dean of the faculty)

9. Educational and methodological support

- electronic educational course of the educational discipline (on the educational portal of NUBiP of Ukraine eLearn - https://elearn.nubip.edu.ua/course/view.php?id=1715) (дата останньої атестації курсу 2020 р.);
- abstracts of lectures and their presentations (in electronic form - https://elearn.nubip.edu.ua/course/view.php?id=1715);
- 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

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.

10. 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., Lukhogrud 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. СОУ ISO 19136:2009 "Обмінний формат геопросторових даних на основі географічної мови розмітки GML (ISO 19136:2007)" // 30.09.2010

13. СОУ 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: http://rada.gov.ua