NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Geoinformatics and Aerospace Research of the Earth

«APPROVED»
Dean of the Faculty of Land managemen
_____ T.O. Ievsiukov
«__» _____ 2021 year.

APPROVED by department of Geoinformatics and Aerospace Research of the Earth
Protocol № 15 «11» May 2021 year.

Head of department of Geoinformatics and Aerospace Research of the Earth
_____ S.S. Kokhan

PROGRAMME

GEOINFORMATION SYSTEMS AND DATABASES

Field of knowledge	19. Architecture and Construction
Specialty	193. Geodesy and land management
Specialization	
Faculty	Land management
Authors	Accos. prof. Drozdivskyi O.P..
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	(position, academic degree, title)

Kyiv – 2021

Programme

discipline « GEOINFORMATION SYSTEMS AND DATABASES» for students of course training for students by Specialty 193. «Geodesy and land management»

Authors: Drozdivskyi O.P, Moskalenko A.A.,

Approved by department of department of Geoinformatics and Aerospace Research of the Earth, Protocol No 15, 11 may 2021

Head of department of department of Geoinformatics and Aerospace Research of the Earth

“11”may 2021. _____ (S.S. Kokhan)
(signature) (name)

Approved by the Educational Council of Faculty of land management department
Protocol “13” May 2021. No 10

“__” _____ 2021. Head _____ (T.O. Ievsiukov)
(signature) (name)

1. Опис навчальної дисципліни / Description of the discipline

Geoinformation systems and databases

Branch of knowledge, direction of education, specialty, educational-qualification level (EQL)		
Educational-qualification level	Bachelor	
Direction		
Specialty	193. Geodesy and land management	
Specialization		
Discipline characteristic		
Type	Normative	
Total hours	210	
ECTS credits	7,0	
Thematic modules	4	
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	3	
semester	5	
lectures	30 hours	
practical, seminar	- hours	
laboratory	45 hours	
self-dependent work	135 hours	
individual work	- hours	
amount of inclass work per week, hours	5 hours	

2. Мета і завдання навчальної дисципліни / Purpose and tasks of the discipline Geoinformation systems and databases

Aim of the discipline: The course "GIS and Database" provides the opportunity to use in program-technical complex for automated recording, storing, displaying, analyzing, modeling of spatially coordinated information and creating databases.

Tasks of discipline is forming as the specialist and subsequent practical use of technologies of GIS and databases is the task of study of discipline, in particular, geodatabase knowledge and practical skills of work on a computer in MS Access environment, and basic receptions of development and work, with the databases in MS Access.

Students after study of the course should know:
basics of the geoinformation systems;
basic concepts and determination of database theory;
database System Concepts and Architecture;
stages of database design;
relational Algebra and Relational Calculus;
SQL-Schema Definition, Constraints, and Queries;
functional Dependencies and Normalization for Relational Databases.

Students after study of the course should be able:
creating vector topological model;
editing vector topological model;
creating relational databases and work with it;
creating conceptual and logical data models;
realizing physical data model;
development of database structure in MS Access;
development of forms and queries in MS Access and data entering to base;
use GIS and databases for land management;
combining database and vector topological model.

The discipline provides the formation of a number of competencies:
- general competencies:
GC06 - Ability to use information and communication technologies.
- special competencies:
SC03. Ability to apply regulations, regulatory and technical documents, reference materials in professional activities.
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.
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.
learning results:
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.
LR5. Apply conceptual knowledge of natural and socio-economic sciences in performing tasks of geodesy and land management.
LR9. Collect, evaluate, interpret and use geospatial data, metadata on objects of natural and man-made origin, apply statistical methods of their analysis to solve specialized problems in the field of geodesy and land management.
LR14. Plan complex professional activities, develop and implement projects in the field of geodesy and land management under resource and other constraints.

3. Програма та структура навчальної дисципліни / Program of the discipline Geoinformation systems and databases

SEMANTIC MODULE I.
INTRODUCTION AND CONCEPTUAL MODELING

Theme 1. Introduction to Geoinformation science.

Information Technology and Geography. The Purpose of GIS. GIS is a tool. Organization of Information in a GIS. Spatial information. GIS is a database application

Theme 2. Model of spatial data: vector and object data models.

The basic definition of vector models. Vector non-topological and topological models. Advantages and disadvantages of vector models. Vector data - methods of saving.

Theme 3. Model of spatial data. Mosaic models.

Principles of modeling surfaces. Structures modeling the earth's surface. Raster model. Methods of compression grid structures. Hexagonal model. TIN-model. Problems using grid structures. Hierarchical data model mosaic.

SEMANTIC MODULE II. MODERN TECHNOLOGY OF DATABASES

Theme 4. Basic concepts and determination of database theory.

Determination of databases. Classification of databases. Database management systems (DBMS), their possibilities, description and use. Models of data. Possibilities and application of geodatabase in land management. Database system architecture. Review maker of DBMS products.

Theme 5. Stages of database design

Basic stages of planning of database. Conceptual design of base, basic stages and operations. Logical planning of base, basic stages and operations. Physical planning of database, basic stages and operations.

Theme 6. Database system concepts and architecture

Data models, schemas and instances. Categories of data models. Schemas, instances and database state. Three-schema architecture and data independence. Database languages and interfaces. Classification of database management systems. Hierarchical and network models.

Theme 7. Relational database design

Main concepts of relational database. Domains, relationships, corteges, attributes. Types of communications, that are used in the relation bases of given.

SEMANTIC MODULE III. DATABASE DESIGN

Theme 8. Data modeling using the entity-relationship model

Entity-Relationship(ER) Model. Entity Type / Entity Set. Attributes. Entity Roles. Weak Entity Type. Relationship Attributes. Structural Constraints.

Theme 9. Normalization as way to control of database structure. Normal forms 1-3

Informal design guidelines for relation schemas. Semantics of the relation attributes. Null values in tuples. Functional dependencies. Normal forms based on Primary key. First normal form. General definition of second and third normal form.

Theme 10. Normalization. The heist normal forms

Boyce-Codd normal form. Next normal forms. Normalization advantages and disadvantage. Denormalization.

Theme 11. Modern database methodology infological design

The transition from conceptual model to infological model. ER-diagrams of Martin and Barker

SEMANTIC MODULE IV. OPERATIONS WITH DATA

Theme 12. Relational algebra.

The main concepts of relation algebra. Unary relation operators: **select** and **project**. Sequences of operations and the **rename** operation. Relation algebra operations from set theory. Additional relational operations. The tuple relational calculus.

Theme 13. Operation and query languages.

Set theory. Classification languages instrumentakity in DBMS. SQL-schema definition. Types queries. Queries constraints. Select query. Parameter query. Cross-tab query. Action query. SQL query An advanced query that is created by using an SQL statement. Data select and mathematical operation in GIS.

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. Basics of Geoinformation systems and tecnologies												
Theme 1. Introduction to Geoinformation science	1	26	2		4		20					
Theme 2. Model of spatial data: vector and object data models	2	18	2		6		10					
Theme 3. Model of spatial data. Mosaic models	3	16	2		4		10					
Total by Semantic module 1		***60***	***6***		***14***		***40***					
SEMANTIC MODULE II. Modern technology of databases												
Theme 4. Basic concepts and determination of database theory	4	13	1		2		10					
Theme 5. Stages of database design	5	8	1		2		5					
Theme 6. Database system concepts and architecture	6	12	2				10					
Theme 7. Data modeling using the entity-relationship model	7	16	2		4		10					
Theme 8. Relational database design	8	11	2		4		5					
Total by Semantic module 1		***60***	***8***		***12***		***30***					
SEMANTIC MODULE III. Database design												
Theme 9. Normalization as way to control of database structure. Normal forms 1-3	9	16	2		2		5					
Theme 10. Normalization. The heist normal forms	10	16	2		2		5					
Theme 11. Modern database methodology infological design	11	2	2				10					
Total by Semantic module 1		***30***	***6***		***4***		***20***					
SEMANTIC MODULE IV. Operation with data												
Theme 12. Relational algebra	12	21	2		6		15					
Theme 13. Operation and query languages	13-15	39	6		7		10					
Total by Semantic module 2		***60***	***8***		***13***		***25***					
Усього годин		**210**	**30**		**45**		**135**					

4. Теми семінарських занять / Topics of seminars lessons

№	Topic	Hours

5. Теми практичних занять / Topics of practice lessons

№	Topic	Hours

6. Теми лабораторних занять / Topics of laboratory lessons

№	Topic	Hours
1	Interface of the geoinformation system	2
2	Basics of geospatial data sets	2
3	Creating vector data sets	6
4	Editing graphical mistakes.	4
5	Adding of attribute data	2
6	Formation of technical specifications database design.	2
7	Creating conceptual model DB	4
8	Creating logical model DB	4
9	Normalization	2
10	Normalization (next steps)	2
11	Creating physical model DB	2
12	Entering data into DataBase	4
13	Export data into GIS	2
14	Combining database and vector topological model	1
15	Simple queries and GIS	4
Разом		**45**

7. Самостійна робота /Task for independent work of students

№	Topic	Hours
1	Industrial GIS	20
2	Vector data model	10
3	Mosaic data model	10
4	Methods of data capture for a database	10
5	Distributed database	5
6	Extended model «Entity – relationship»	10
7	Data modeling	10
8	Relational database design	5
9	Functional dependencies	5
10	Transitive dependencies	5
11	Methodology infological design	10
12	Relational algebra and calculus	10
13	Language SQL: determination of data. Query processing	25
Разом		**135**

Task № 1. **Industrial GIS** *(20 hours)*

Plan

1. ArcGIS.
2. Quantum GIS.

List of the recommended literature

1. http://www.arcgis.com/features/.
2. http://www.qgis.org/en/site/

Task № 2 Vector data model *(10 hours)*

Plan

1. Vector non topological data model.
2. Vector topological data model.

List of the recommended literature

1. http://www.arcgis.com/features/.
2. http://www.qgis.org/en/site/

Task № 3 Mosaic data model *(10 hours)*

Plan

1. Raster model.
2. Hierarchical data model mosaic.

List of the recommended literature

1. http://www.arcgis.com/features/.
2. http://www.qgis.org/en/site/

Task № 4. Methods of data capture for a database *(10 hours)*

Plan

1. Planning of database development.
2. Determination of system requirements.
3. Collection and analysis of user requirements.
4. Document study of customer.
5. Interviews and questionnaire.
6. Supervision at work of customer.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.

2. Fundamentals of Database Systems, 4/E Ramez Elmasri, University of Texas at Arlington Shamkant B. Navathe, Georgia Institute of Technology, 2005

Task № 5. Distributed database *(10 hours)*

Plan

1. Basic idea distributed data bases and distributed data processing.
2. Functions of distributed DBMS.
3. Technologies and facilities of data scatter – basic concepts.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.

2. Глушков С.В., Ломотько Д.В. Базы даннях. – Харьков: Фолио, 2002. – 504 с.

3. Голицина О.Л., Максимов Н.В., Попов И.И. Базы данных. – М.: Форум, 2006. – 352 с.

4. Fundamentals of Database Systems, 4/E Ramez Elmasri, University of Texas at Arlington Shamkant B. Navathe, Georgia Institute of Technology, 2005

Task № 6. Extended model «Entity – relationship» *(10 hours)*

Plan

1. Superclasses/subclass and inheritance of attributes.
2. Specification / generalization – basic concepts and processes.
3. Aggregation.
4. Composition.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.

Task № 7. Data modeling *(10 hours)*

Plan

1. Entity-Relationship(ER) Model.
2. UML

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.
2. Fundamentals of Database Systems, 4/E Ramez Elmasri, University of Texas at Arlington Shamkant B. Navathe, Georgia Institute of Technology, 2005

Task № 8. Relational algebra and relational calculus *(10 hours)*

Plan

1. Unary operations – basic concepts and determination.
2. Operations with ensembles.
3. Operations of connection.
4. Operations of division.
5. Relational calculusof tuples.
6. Relational calculusof domains.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.
2. Глушков С.В., Ломотько Д.В. Базы даннях. – Харьков: Фолио, 2002. – 504 с.

Task № 9. Functional dependencies *(10 hours)*

Plan

1. Functional dependency.
2.Normalization process.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.
2. Голицина О.Л., Максимов Н.В., Попов И.И. Базы данных. – М.: Форум, 2006. – 352 с.
3. Fundamentals of Database Systems, 4/E Ramez Elmasri, University of Texas at Arlington Shamkant B. Navathe, Georgia Institute of Technology, 2005

Task № 10. Transitive dependencies *(10 hours)*

Plan

1. Transitive dependencies.
2. Normalization process.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.
2. Голицина О.Л., Максимов Н.В., Попов И.И. Базы данных. – М.: Форум, 2006. – 352 с.
3. Fundamentals of Database Systems, 4/E Ramez Elmasri, University of Texas at Arlington Shamkant B. Navathe, Georgia Institute of Technology, 2005

Task № 12. Language SQL: determination of data *(5 hours)*

Plan

1. Data types of SQL.
2. Supporter of data integrity.
3. Data-bases design in SQL.
4. Work with tables in SQL.
5. Work with submissions in SQL.
6. Work with indexes in SQL.
7. Access control to data by SQL.

List of the recommended literature

1. Коннолли Т., Брег К. Базы данных. 3-е изд.: Пер. с англ. – М.: Изд. дом «Вильямс», 2003. – 1440 с.
2. Глушков С.В., Ломотько Д.В. Базы даннях. – Харьков: Фолио, 2002. – 504 с.
3. Голицина О.Л., Максимов Н.В., Попов И.И. Базы данных. – М.: Форум, 2006. – 352 с.

Task № 13. Query processing *(10 hours)*

Plan

1. Query processing in Spatial models.
2. Spatial Join and refinement steps.

List of the recommended literature

1. Geographic information systems / M. Van Meirvenne, Svitlana Kokhan, roman Ananchenko, NAUU, 2003

2. Fundamentals of Database Systems, 4/E Ramez Elmasri, University of Texas at Arlington Shamkant B. Navathe, Georgia Institute of Technology, 2005

8. Control Questions, Tests.

1. What is GIS?
2. How to relate information using GIS?
3. Define the elements of a GIS.
4. What is Raster Method?
5. Define GIS and other information systems.
6. Define Data Representation and Projection in GIS.
7. What is a Database?
8. What is a Database Management System (DBMS)?
9. Define the classification of databases.
10. What is data models?
11. What is a Database System Concepts?
12. What is a Schema construct?
13. Define the Categories of Data Model.
14. What is Database languages and interfaces?
15. What is a Database design?
16. What is a Conceptual Database Design?
17. Define the Basic stages of planning of database.
18. What is Physical Database Design?
19. Define the Steps in Database Design.
20. What is a Relational model concepts?
21. What is a Constraints?
22. Define the Relational model constraints and relational DB schemas.
23. Discuss each of the following concepts in the context of the relational data model: (a) relation; (b) attribute; (c) domain; d) tuple; (e) intension and extension; (f) degree and cardinality.
24. Describe the relationship between mathematical relations and relations in the relational data model.
25. Describe the differences between a relation and a relation schema. What is a relational database schema?
26. Discuss the properties of a relation.
27. Discuss the differences between the candidate keys and the primary key of a relation. Explain what is meant by a foreign key. How do foreign keys of relations relate to candidate keys? Give examples to illustrate your answer.
28. What is data model? What is attribute?
29. What are structural constraints?
30. What kind of information does the cardinality ratio give us?
31. In how many different ways can two entities be involved in a cardinality relationship? Give examples.
32. What kind of information does the participation constraint give us?
33. Is it always necessary to have cardinality ratios as well as participation constraints in the same ER diagram? Why? Explain.
34. Define the five basic relational algebra operations. Define the Join, Intersection, and Division operations in terms of these five basic operations.

35. Discuss the differences between the five Join operations: Theta join, Equijoin, Natural join, Outer join, and Semijoin. Give examples to illustrate your answer.

36. Compare and contrast the tuple relational calculus with domain relational calculus. In particular, discuss the distinction between tuple and domain variables.

37. What is the difference between a procedural and a non-procedural language? How would you classify the relational algebra and relational calculus?

38. What are the advantages and disadvantages of SQL?

39. Explain the function of each of the clauses in the SELECT statement. What restrictions are imposed on these clauses?

40. What restrictions apply to the use of the aggregate functions within the SELECT statement? How do nulls affect the aggregate functions?

41. Explain how the GROUP BY clause works.

42. What is functional dependency?

43. What does the term unnormalized relation refer to?

44. How did the normal forms develop historically from first normal form up to Boyce-Codd normal form?

45. Define first normal form.

46. Define second normal form.

47. Define third normal form.

48. Define Boyce-Codd normal form.

9. Methods of teaching

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 control

The main methods of control of knowledge and skills students have to study the subject " Geoinformation systems and databases" 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 during study

Student's evaluation takes place according to "Про екзамени та заліки НУБіП України" dated 27/12/2019. The protocol №5 of Table 1.

The national grade	Total points for all the educational activities
EXCELENT	90-100
GOOD	74-89
SATISFACTORILY	60-73
UNSATISFACTORILY	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 with reasonable excuse, 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 with reasonable excuse and doesn't have the compendium of lecture, student will have **grade equal 0.**

If student skipped lecture without reasonable excuse, 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 with reasonable excuse, 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 without reasonable excuse 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 $\mathbf{R_{add}}$ and rating of penalty $\mathbf{R_{penalty}}$ 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.

Rating evaluations system of educational work for the substance modules

	Type of work	Module				Course	
		point by work	percent by		total	percent by modules	total
			work	module			
Module # 1	Laboratory work #1	100	10 %	80%	100	20 %	100
	Laboratory work #2	100	12 %				
	Laboratory work #3	100	15 %				
	Laboratory work #4	100	15 %				
	Self-work	100	28 %				
	Module test / control	100	20 %	20 %			
Module # 2	Laboratory work #5	100	10 %	80 %	100	20 %	
	Laboratory work #6	100	10 %				
	Laboratory work #7	100	10 %				
	Laboratory work #8	100	10 %				
	Self-work	100	40 %				
	Module test / control	100	20 %	20 %			
Module # 3	Laboratory work #9	100	20 %	80 %	100	10 %	
	Laboratory work #10	100	20 %				
	Self-work	100	30 %				
	Module test / control	100	30 %	20 %			
Module # 4	Laboratory work #11	100	10 %	80 %	100	20 %	
	Laboratory work #12	100	10 %				
	Laboratory work #13	100	10 %				
	Laboratory work #14	100	5 %				
	Laboratory work #15	100	15 %				
	Self-work	100	30 %				
	Module test / control	100	20 %	20 %			
Final test		100				30 %	

12. Textbooks

1. Кохан С.С., Москаленко А.А., Іванюта О.О. Geoinformation systems and databases (a series of lectures) для студентів напряму підготовки «Геодезія, картографія та землеустрій» - К.: ЦК «КОМПРИНТ»,2014. У.д.а = 5,9.

2. Кохан С.С., Москаленко А.А., Іванюта О.О. Geoinformation systems and databases (methodological guideline for laboratory classes) для студентів напряму підготовки «Геодезія, картографія та землеустрій» - К.: ЦК «КОМПРИНТ»,2014. У.д.а = 8,9.

13. **Recommended literature**

Basic:

1. Allen Taylor. SQL For Dummies, 9th edition. 2020 – 544p.
2. Database Systems: A Practical Approach to Design, Implementation, and Management Third Edition / Thomas Connolly, Carolyn Begg. 2014 – 1440 p.
3. Ekmasri, R. and Navatane, S.B. Fundamentals of Database Systems, 7th ed., Addison-Wesly, Reading, Boston, MA, 2017
4. Geographic information systems / M. Van Meirvenne, Svitlana Kokhan, roman Ananchenko, NAUU, 2003
5. Геоінформаційні системи і бази даних: монографія / В. І. Зацерковний,З-38В. Г. Бурачек, О. О. Железняк, А. О. Терещенко. – Ніжин: НДУ ім. М. Гоголя, 2014. – 492 с.
5. Картография и ГИС / Вячеслав Раклов – 2014 – 215 с.

Additional:

1. Голицина О.Л., Максимов Н.В., Попов И.И. Базы данных. – М.: Форум, 2006. – 352 с.

2. ДеМерс М. Географические информационные системы.: Пер. с англ. – М.: Дата+, 1999. – 490 с.

3. Інформатика та комп'ютерна техніка: Навч.-метод. посібник / За заг. ред. О.Д. Шарапова. – К.: КНЕУ, 2002/

4. Sikha Bagui, Richard Earp. Database design using Entity-Relationship Diagrams, CRC Press, RBoca Raton, Florida, 2000.4. ISO/TS 19104:2008 «Geographic information – Terminology».

5. ISO 19107:2003 «Geographic information - Spatial schema».

6. ISO 19108:2002 «Geographic information - Temporal schema»

7. ISO 19110:2005 «Geographic information - Methodology for feature cataloguing»

8. ISO 19115 «Geographic information - Metadata»

14. Information resources:

1. **eLearn webpage -** https://elearn.nubip.edu.ua/course/view.php?id=158
2. http://2k8618.blogspot.com/2011/07/database-management-systems-dbms.html
3. http://www.scribd.com/doc/2166197/Relational-Algebra-and-Relational-Calculus
4. http://www.sybaseteam.com/dbms-concepts-by-navathe-and-elmasri-ppt-files-t-473.html
5. http://www.techopedia.com/definition/24559/relational-model-database