# AGROFORESTRY

## Department of Forest Reproduction and Forest Reclamation

## Education and Research institute of forestry and landscape-park management

Specialty 193 Geodesy and land management

| | |
|---|---|
| ***Lecturer*** | **Vasyl Yukhnovskyi, Dr.Sc., Professor** |
| ***Term*** | **8** |
| ***Major*** | **Bachelor** |
| ***ECTS credits*** | **4** |
| ***Control*** | **Test** |
| ***Class-room hours*** | **45 hours (of them: lectures – 15 hours, practical classes – 30 hours)** |

## Subject overview

The purpose of studying the discipline is connected with the need to solve the problems of ecological balance of the land structure, establishing an optimal ratio of arable land, natural lands, forest and water resources, the specifics of the scientific justification of agriculture and agroforestry in modern forest-agrarian ecological systems, as well as studying the need the use of agroforestry plantations as a means of effective protection of agricultural lands from adverse natural phenomena and improvement of the natural environment, formation of the ecological framework of agro-landscapes. The main tasks: to acquaint students with the scientifically based possibilities of using the ameliorative effect of protective forest plantations on the state, stability and productivity of agricultural complexes and landscapes, as well as to carry out agroforestry land amelioration, aimed at the creation and effective functioning of completed systems of agroforestry plantings of various purposes.

## Lectures:

1. General information about the forest.
2. Fundamentals of forestry and forest inventory.
3. Forestry-measurement characteristics of agrofotrestry plantations.
4. Protective afforestation. Windbreaks.
5. Forest meliorate stands – the element of the erosion control system.
6. Agroforestry systems, practice and technologies.
7. Greening of rural places.

**Practical classes:**

1. Forest and its components. Differentiation of trees in a forest.
2. Morphological and ecological characteristics of tree and shrub species in agroforestry stands.
3. Organizational and economic measures under ordering territory. Elimination of erosion of funds.
4. Design of protective forest plantations in terms of land use.
5. Selection of species, development of designs, creation of schemes of mixture of species for agroforestry plantations.
6. Determining the amount of wood and forestry-evaluation indicators of agroforestry plantations.

# DIGITAL PLANS AND MAPS

## Department of Geoinformatics and Aerospace Research of the Earth

## Faculty of Land Management

| | |
|---|---|
| ***Lecturer*** | **Moskalenko Antonina Anatolyivna** |
| ***Term*** | **6 semesters** |
| ***Major*** | **Bachelor's degree** |
| ***ECTS credits*** | **3** |
| ***Control*** | **Final test** |
| ***Class-room hours*** | **90 hours (of them: lectures – 15 hours, laboratory classes – 45 hours)** |

## Subject overview

The course "Digital Plans and Maps" introduces students the basics of digital mapping and the possibilities of GIS application in creating of digital cartographic products. The course covers issues related to the requirements for digital plans and maps, and the ways to displaying objects, determining the quality of digital cartographic data, as well as spatial data formats, technologies of designing digital plans and maps, and encoding cartographic information.

The course provides obtaining the capabilities in creating and filling basic cartographic layers, making plans based on vector models, editing spatial and attribute data, designing cartographic materials with the formation of a set of topographic symbols in ArcGIS-ArcMap and cartographic signs for individual thematic layers.

Aim of the: The course "Digital plans and maps» provides obtaining skills of GIS cartographic modeling for land management and land cadaster.

The aim of the discipline: To learn main principle, methods and means of geoinformation mapping to use in land management and land cadaster.

Tasks of the discipline: formation theoretical knowledge in the area of GIS mapping and obtaining practical skills in GIS applications in designing digital plans and maps.

## Lectures:

1. Terminology in digital mapping (2 hours).
2. Methods of displaying objects (2 hours).
3. Standardization of geographic information (2 hours).
4. Sources for digital mapping and map design (2 hours).
5. Technology of designing digital maps and plans (4 hours).
6. Classificatory of electronic map (3 hours).

**Laboratory classes:**

1. Work with layers of basic map.
2. Construction of symbols (points) for digital maps (various scales).
3. Construction of symbols (lines) for digital maps (various scales).
4. Construction of symbols (polygons) for digital maps (various scales).
5. Features and attributes. Data coding.
6. Construction of symbols. Text labels.
7. Construction of symbols. Categories and quantities.
8. Construction of symbols. Charts.
9. Construction of symbols. Multiple attributes.
10. Digital map composition. Legend, north arrow and scales.
11. Digital map composition. Graphs and reports.
12. Determine the position of the starting point by variant. Georeferencing of raster using ArcMap.
13. Creating digital map by variant. Find and creating shapefiles.
14. Creating digital map by variant. Vectorization.
15. Editing digital map by variant.
16. Filling the knowledge base of digital maps by variant.
17. Creating digital map by variant in ArcGIS Online.
18. Editing digital map by variant in ArcGIS Online.
19. Map composition in ArcGIS Online.

# ENVIRONMENTAL MONITORING

**Department of General Ecology radiobiology and Safety of Life Activity**

**Faculty of Land Management**

| | |
|---|---|
| ***Lecturer*** | **docent Rakoid O.O., PhD on agrarian sciences** |
| ***Term*** | **Course 1, Semester 2** |
| ***Major*** | **Bachelor degree** |
| ***ECTS credits*** | **4** |
| ***Control*** | **Credit** |
| ***Class-room hours*** | **30 hours (of them: lectures – 15 hours, practical or laboratory classes – 15 hours)** |

## Subject overview

The discipline "General Ecology" aims to deepen knowledge about the environment; to form ecological thinking and worldview of future specialists, in the first instance due to growing ecological threats and challenges in modern times.

Purpose of study is to learn basic concepts, principles and laws of ecology; to know the evolution of the relationship between human and environment and structure of the environment; to understand the relationship between living organisms in the biosphere and opportunities of their sustainable development; to introduce the causes, extent, signs and ways of solutions of the global environmental crisis; to promote formation the theoretical knowledge and practical skills on the problems of different components of the environment; estimation of possible anthropogenic impact on the environment; prediction of changes in the state of environment as well as working out the scientifically-grounded recommendations for realization of nature protection measures.

## Lectures:

1. Basic concepts and definitions of ecology as a science.
2. The concept of the biosphere. Components of the environment.
3. Ecological factors. Interaction between biological systems and the environment.
4. Structure and principles of ecosystem functioning.
5. Ecosystem dynamics and resilience.
6. Environmental issues of the current state of system “Nature−Society”.
7. Human impacts on the planet. Achieving environmental sustainability.

**Classes:**

***(practical, laboratory classes)***

1. Relationships of ecology with other natural disciplines. Stages of formation of ecology as a science.
2. Basic laws of ecology. Ecological laws-axioms of B. Commoner.
3. The impact of abiotic environmental factors on living organisms. Biotic factors and interactions in ecosystems.
4. The study of trophic relationships in an ecosystem. Practical application of the rule of the ecological pyramid and the law of bioaccumulation (concentration).
5. Consequences of the impact of human activity on natural systems at the global level.
6. Problems of ensuring environmental sustainability in Ukraine by the example of the "small motherland".
7. Problems of sustainable environmental management. Principles of sustainable production and consumption. Calculation of the individual ecological footprint.

# GEOINFORMATICS, INFORMATICS AND PROGRAMMING

## Department of Geoinformatics and Aerospace Research of the Earth

## Faculty of Land Management

| | |
|---|---|
| ***Lecturer*** | **Prymak Lidiya Vasylivna** |
| ***Term*** | **1, 2, 3 semesters** |
| ***Major*** | **Bachelor's degree** |
| ***ECTS credits*** | **6** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **180 hours (of them: lectures –45 hours, laboratory classes –90 hours)** |

## Subject overview

Tasks of Geoinformatics, Informatics and Programming discipline is to develop an expert understanding of the prospects for further development and practical use of general computer technology, basic theoretical knowledge, and practical computer skills in geoinformatics. Students start with the advanced usage of OS Windows and Microsoft Office package Office (Word, Excel, PowerPoint etc.) to form professional land management documentation, then continue with the processing land management data with the high-level programming 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. In this part of course students work in Google Earth Pro and QGIS applied software. They get familiar with vector and raster models of geographical objects, learn to analyze them, and make decision based in object geographical location.

## Lectures:

1. Theoretical prerequisites for the study of geoinformatics.
2. Modern technical means of working with data.
3. Digital transformation.
4. Use of word processors when performing land management works.
5. Working with tables in text editors.
6. Work with graphic objects in text editors.
7. Work with scientific and technical documentation.
8. The use of table processors when performing land management works.
9. Work with formulas and functions in spreadsheet processors.
10. Visualization of data in the form of diagrams by means of spreadsheet processors.

11. Modern programming languages. The basic syntax of the Python language.
12. The concept of control structures in programming. Functions.
13. Work with complex data types.
14. Work with files.
15. From geography to geoinformatics.
16. Basics of spatial thinking.
17. Domains of geographic information.
18. Geographical fields and objects as the main entities of geographical space.
19. Vector and object models of spatial data.
20. Mosaic models of spatial data.
21. From geoinformatics to GIS and databases.

**Laboratory classes:**

1. Work in the Windows OS environment. Basic actions with files and folders.
2. Moodle distance learning information system of the university. Part1.
3. Moodle distance learning information system of the university. Part 2.
4. Moodle distance learning information system of the university. Part 3.
5. Work with antivirus programs.
6. Text editing and formatting. Part 1.
7. Text editing and formatting. Part 2.
8. Entering special characters in MS Word.
9. Working with tables in MS Word.
10. Work with simple graphic images in the form of flowcharts in text documents.
11. Working with WordArt text, SmartArt pictures and other graphics in MS Word.
12. Work with the formula editor and elementary calculations in MS Word.
13. Word processor MS Word: work with links and footers.
14. Document review in MS Word.
15. Text editor MS Word. Document review.
16. Creation of spreadsheets and data entry in MS Excel spreadsheet.
17. Formatting and editing the table structure in MS Excel.
18. Conditional formatting of table cells.
19. Work with formulas in the MS Excel table editor.
20. Working with sheets in the MS Excel table editor, exchanging data between sheets.
21. Table editor MS Excel: work with diagrams.
22. MS Excel table editor: creation of value distribution diagrams.
23. Basics of programming in Python.
24. Program structure, data, expressions and operations in Python.
25. Programming functions in Python.

26. Conditional and looping flow control structures in the Python programming language.
27. Lists and tuples (records) in Python.
28. Arrays in Python.
29. Dictionaries and working with files in Python.
30. Date and time objects in Python.
31. Introduction to the Google Earth Pro interface.
32. Setting up Google Earth Pro software.
33. Search and organization of search results for geographic objects using Google Earth Pro.
34. Geometric primitives in Google Earth Pro: types, creation and customization of styles. Part 1.
35. Geometric primitives in Google Earth Pro: types, creation and customization of styles. Part 2.
36. Working with 4D data in Google Earth Pro.
37. Cartometric operations in Google Earth Pro, video presentation of work results.
38. The basics of working with QGIS.
39. Working with map layers. Part 1.
40. Working with map layers. Part 2.
41. Getting information about layer objects.
42. Search for objects by attribute data.
43. Cartometric operations.
44. Map layout. Part 1.
45. Map layout. Part 2.

# GEOINFORMATION LAND CADASTRAL SYSTEMS

## Department of Geoinformatics and Aerospace Research of the Earth

## Faculty of land management

| | |
|---|---|
| ***Lecturer*** | **Koshel Anton, Dr.Sc., Associate Professor** |
| ***Term*** | **Academic year 4** |
| ***Major*** | **Bachelor degree** |
| ***ECTS credits*** | **3** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **90 hours (of them: lectures – 15 hours, practical or laboratory classes –30 hours)** |

## Subject overview

The purpose of the course is to master and acquire the necessary theoretical knowledge and practical skills in the field of geoinformation support of the state land cadastre and knowledge formation on the development of geoinformation land cadastral national systems of Ukraine and the world, the contribution of Ukrainian and foreign scientists.

The task of studying the discipline is to form a specialist's theoretical knowledge and practical skills of geoinformation support of land cadastral works for planning the development of territories, inventory of land resources, forecasting the state of the land fund, control over the use and protection of soils.

## Lectures:

1. Objectives and content of the course. The concept of geoinformation support of land cadastre.
2. Regulatory documents and standardization in the study of the discipline "Geoinformation land cadastral systems".
3. Equipment and software for the implementation of geographic land cadastral system.
4. Geoinformation modeling. Land cadastral databases. Data banks.
5. Functions of land information systems.
6. Information base of geoinformation systems. The concept of creating geographic information land cadastral systems.
7. Fundamentals of analysis and cartographic modeling. Cartographic support of cadastre.
8. Basics of creating land cadastral information. Cartographic methods of working with land cadastre. Index cadastral map (plan).

**Classes:**

***(practical, laboratory classes)***

1. Creation of vector layers of an indo-cadastral map (plan).
2. Vectorization of land cadastre data.
3. Creation of database structure and introduction of land cadastral attributive information.
4. Creating the layout of graphic materials.
5. Layout of graphic materials. Creation of the index-cadastral map of the district and a separate administrative-territorial unit.
6. Filling the geodatabase with attribute land cadastral geodata. Land cadastral geodata and their characteristics.
7. Introduction of the land cadastre geodata to the existing database.

# GEOINFORMATION SYSTEMS AND DATABASES

## Department of Geoinformatics and Aerospace Research of the Earth

## Faculty of Land Management

| | |
|---|---|
| ***Lecturer*** | **Moskalenko Antonina Anatolyivna** |
| ***Term*** | **5 semesters** |
| ***Major*** | **Bachelor's degree** |
| ***ECTS credits*** | **7** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **210 hours (of them: lectures – 30 hours, laboratory classes – 45 hours)** |

## Subject overview

The course "Geoinformation systems and databases" consists of topics related to fundamentals of GIS technologies and concepts of database theory; their architecture and stages of construction. The features of the hierarchical, network, relational and object-oriented database models are considered. The design of relational databases, relational algebra, functional dependencies and normalization, the basic elements of SQL and the use of ER-diagrams and UML for building database structures are studied.

Students get practical experience in designing conceptual, logical and physical data models, attribute input into database, constructing spatial components of the vector-based topological model and queries application to the spatial components.

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 database environment, and basic receptions of development and work, with the databases in database.

## Lectures:

1. Introduction to Geoinformation science (2 hours).
2. Model of spatial data: vector and object data models (2 hours).
3. Model of spatial data. Mosaic models (2 hours).
4. Basic concepts and determination of database theory (2 hours).
5. Stages of database design (2 hours).
6. Database system concepts and architecture (2 hours).

7. Data modelling using the entity-relationship model (2 hours).
8. Relational database design (2 hours).
9. Normalization as way to control of database structure. Normal forms 1-3 (2 hours).
10. Normalization. The heist normal forms (2 hours).
11. Modern database methodology infological design (2 hours).
12. Relational algebra (2 hours).
13. Operation and query languages (6 hours).

**Laboratory classes:**

1. Creation of layers of geospatial data.
2. Determination of the design boundary of the geospatial data base.
3. Vectorization. Part 1.
4. Vectorization. Part 2.
5. Vectorization. Part 3.
6. Editing vector layers. Part 1.
7. Editing vector layers. Part 2.
8. Forming a technical task for designing a geospatial database.
9. Entering attribute data. Part 1.
10. Entering attribute data. Part 2.
11. Creation of a conceptual model of the database.
12. Creating a logical database model. Part 1.
13. Creating a logical database model. Part 2.
14. Normalization. Part 1.
15. Normalization. Part 2.
16. Normalization. Part 3.
17. Creating a physical database model. Part 1.
18. Creating a physical database model. Part 2.
19. SQL query language. Part 1.
20. SQL query language. Part 2.
21. Calculation of secondary attributes of subject area objects. Creation of new object classes.
22. Client-server architecture in the formation of requests to the database.

# GEOLOGY AND GEOMORPHOLOGY

## Department of Soil Science and Soil Conservation Department

## Faculty of Land Management

| | |
|---|---|
| ***Lecturer*** | **Yuriy Kravchenko** |
| ***Term*** | **1** |
| ***Major*** | **Bachelor** |
| ***ECTS credits*** | **3** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **45 hours (of them: lectures – 30 hours, practical or laboratory classes – 15 hours)** |

## Subject overview

This course is an introductory designed course for the Bachelor student, which provides the basic concepts of all aspects of geology. It encompasses: Earth's origin; internal and external Earth's dynamics; minerals and rocks: formation, composition, diagnostics and properties changes; agronomic ores properties and application; anthropogenic influence on geologic environment. The course gives practical experience as an aid in developing understanding of the minerals, rocks and parent materials as natural bodies, the use of which has an influence on environmental, human society and life in general.

## Lectures:

1. The Earth as space and physical body.
2. Internal and external spheres of the Earth.
3. Magmatic, metamorphic and sedimentary processes.
4. Plate tectonics and crust deformations.
5. Volcanism
6. Earthquakes
7. Weathering.
8. Wind movement.
9. Mass wasting.
10. Rivers.
11. Lakes and bogs.
12. Oceans and seas.
13. Glaciers.
14. Ground waters.
15. The Quaternary period and soil parent materials.

**Classes:**

***(practical, laboratory classes)***

1. Diagnostics of Physical Properties of Minerals.
2. Mineral Properties.
3. Silicates Properties.
4. Igneous Rocks Properties.
5. Metamorphic Rocks Properties.
6. Sedimentary Rocks Properties.
7. Quaternary Deposits and Agronomic Ores.

# MATHEMATICAL STATISTICS FOR GEODATES

## Department of Geoinformatics and Aerospace Research of the Earth

## Faculty of land management

| | |
|---|---|
| ***Lecturer*** | **Koshel Anton, Dr.Sc., Associate Professor** |
| ***Term*** | **Academic year 2** |
| ***Major*** | **Bachelor degree** |
| ***ECTS credits*** | **3** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **90 hours (of them: lectures – 15 hours, practical or laboratory classes – 30 hours)** |

## Subject overview

The discipline "Mathematical statistics for geodates" ensures that students master the fundamentals of using mathematical and statistical methods and applied processing of geodata and indicators regarding the state of land relations based on the use of modern computer technologies.

The task of studying the discipline is the formation of a specialist in theoretical knowledge and practical skills of geostatistics, mathematical and statistical apparatus of geospatial data processing methods and their properties. In particular, the tasks use spectral properties of spatial objects, derived products (vegetation indices, leaf surface area) with corresponding cartographic projections, which require constant transformations and their further practical use on the basis of geoinformation technologies in the GIS analysis of data and indicators regarding the state of land relations and land cadastral data.

## Lectures:

1. The main provisions of probability theory and mathematical statistics.
2. Elementary analysis of geodata and indicators on the state of land relations.
3. Basic statistical models. Basic statistics of data and indicators on the state of land relations.
4. Methods of statistical evaluation of averages.
5. Statistical models of geodata and indicators on the state of land relations based on samples.
6. Fundamentals of statistical analysis of sample geodata.
7. Multidimensional models of geodata.

**Classes:**

***(practical, laboratory classes)***

1. Statistical and variation series of indicators of landowners and land users.
2. Statistical and Variation Series for landowners and land users.
3. Basic statistics of land management indicators.
4. Laws of the distribution of variables of random variables on an example of land valuation.
5. Formation of sampling of land-use geodata from general collections.
6. Criterion of reliability of estimates of cadastral geodata.
7. Test hypotheses about distribution laws.
8. Correlation analysis of land management geodata.
9. Regression analysis of land management geodata.
10. ANOVA of land management geodata.
11. MANOVA of land management geodata.
12. Cluster analysis of land management geodata.
13. Discriminant analysis of land management geodata.
14. Factor analysis of land management data and Principal component analysis.
15. Multidimensional scaling of land management geodata.

# REMOTE SENSING FOR LAND RESOURCES MONITORING

## Department of Geoinformatics and Aerospace Research of the Earth

## Faculty of Land Management

| | |
|---|---|
| ***Lecturer*** | **Moskalenko Antonina Anatolyivna** |
| ***Term*** | **7 semesters** |
| ***Major*** | **Bachelor's degree** |
| ***ECTS credits*** | **2,5** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **90 hours (of them: lectures – 15 hours, laboratory classes – 30 hours)** |

## Subject overview

The course "Remote sensing for Land Resources Monitoring» introduces students how remote sensing can benefit the observation land resources as a tool for acquiring information about the Earth through recording reflected or emitted energy. There are a large number of satellite sensors that vary in temporal, spatial coverage and resolution. Their characteristics and applications for land resources monitoring is observed in the course.

Students will learn the principles of remote sensing, and how relevant information can be derived from remote sensing data over a wide range of spatial and temporal scales and resolutions of sensors. Students will obtain image processing skills and learn how remote sensing data can be used to monitor land resources. The latest state-of-art techniques to analyze and interpret images will be used to understand local and regional changes in land resources.

Course aims: to learn the concepts of remote sensing and to get practical skills of image pre-processing and thematic geoprocessing to be used for monitoring of land resources.

Tasks of the course: to learn theoretical concepts of remote sensing and receiving remote sensing data; to learn general characteristics of optical sensors; to get skills of using methods of digital image processing.

## Lectures:

1. Concepts of remote sensing of the Earth. Electromagnetic radiation
2. Visual interpretation of objects.
3. Classification of methods of remote sensing. Sensor systems.
4. Image acquisition. Data formats. Standards in remote sensing
5. Preprocessing of remotely sensed data
6. Image georeferencing and image transformation
7. Image classification.

**Laboratory classes:**

1. Visual interpretation of image elements in various spectral channels. Interpretation of recognized objects.
2. Measurement of spectral brightness of objects.
3. Radiometric image enhancement.
4. Image resampling.
5. Unsupervised classification.
6. Supervised classification. Training sites.
7. Supervised classification. The quality of training sites.
8. Supervised classification. Application of algorithms of image classification based on hard rules.

# SOIL SCIENCE WITH BASICS OF AGROCHEMISTRY

## Department of Soil Science and Soil Conservation Department

## Faculty of Land Management

| | |
|---|---|
| ***Lecturer*** | **Yuriy Kravchenko** |
| ***Term*** | **2** |
| ***Major*** | **Bachelor** |
| ***ECTS credits*** | **5** |
| ***Control*** | **Exam** |
| ***Class-room hours*** | **60 hours (of them: lectures – 30 hours, practical or laboratory classes – 30 hours)** |

## Subject overview

The course is an introductory designed course for the Bachelor student, which provides the basic concepts of all aspects of soil science. It presents the soil composition and genesis; physical, chemical, and biological properties; soil water; classification and mapping; soil conservation; management practices; soil fertility and productivity (soil testing, use of fertilizers and liming), soil quality assessment. The course gives practical experience as an aid in developing understanding of the minerals, rocks and soils as natural bodies, the use of which has an influence on environmental, human society and life in general.

## Lectures:

1. Introduction to Soil Science.
2. What is soil?
3. Soil formation and soil processes.
4. Soil classification.
5. Soil taxonomy and morphology.
6. Soil physical properties 1. Texture and structure.
7. Soil organic matter.
8. Soil colloids.
9. Sorption, cation and anion exchange.
10. Soil acidity and alkalinity.
11. Soil salinity.
12. Soil physical properties 2. Soil structure, soil density, pore space, impacts of tillage.
13. Soil water.
14. Soil and the hydrologic cycle.
15. Soil climate. Soil air and temperature
16. Soil ecology.
17. Soil productivity and its evaluation.
18. Soils of the Forest Zone of Ukraine.

19. Soils of the Forest-Steppe zone of Ukraine.
20. Soils of the Steppe zone of Ukraine.
21. Alluvial and Meadow Soils.
22. Saline soils.

**Classes:**

***(practical, laboratory classes)***

1. Soil sampling. Lab Safety.
2. Forms (categories) of soil water. Soil hygroscopic moisture determination.
3. Soil granulometry and particle size distribution.
4. International pipette method of soil texture determination.
5-6. Feel and hydrometer methods of soil texture determination.
7. Soil organic matter lab determination.
8. Soil organic matter evaluation.
9. Soil acidity determination.
10. Cation exchange capacity determination.
11. Soil alkalinity and salinity.
12. Soils of the Forest and Forest-Steppe zones of Ukraine.
13. Saline Soils and Soils of the Steppe zone of Ukraine.
14. Wet and mountain soils of Ukraine.
15. Soil Productivity Evaluation.