

ANNOTATIONS FOR THE MASTER DEGREE PROGRAM IN THE FIELD 35.04.03 "AGRO CHEMISTRY AND AGRO SOIL SCIENCE"

Foreign language Annotation

Foreign language is a compulsory subject in the training of Master degree students in all directions. The subject is implemented at the Institute of Agro-ecological technologies by the chair of Professional communication and service.

The process of studying the subject is aimed at formation of the following competencies:

Common cultural competence:

- readiness to self-development, self-realization, to use creative potential (CK-3).

Common professional competences:

- readiness to communicate in oral and written forms in Russian and foreign languages to solve the challenges of professional activity (CPC-1).

The content of the subject covers a range of issues related to everyday speech and professional language for the active use of a foreign language, both in everyday and professional communication.

Teaching subject provides the following forms of educational process organization: the practical (lab) classes, self-study work of students.

The program provides the discipline and the current intermediate monitoring of progress in the form of testing.

The total workload of the subject is 3 credits, 108 hours. The program of the subject provides laboratory works (30 hours) and independent work of the student (78 hours).

Mathematical modeling and design Annotation

The subject "Mathematical modeling and design" is the discipline of a basic part of a general scientific cycle of subjects for Master degree students training in the field 35.04.03 "Agro chemistry and agro soil science". The subject is taught at the institute of Agro-ecological technologies by the chair of Methodology and philosophy of science.

The subject is aimed at formation of common cultural competences:

- the ability to get self-development by means of information technology and to use new knowledge and skills in practical activities, including in new fields of knowledge directly not associated with the field of activity (GC-6);
- the ability to professional operation of the modern equipments and devices (GC-7);

Professional competences:

- the possession of methods for the assessment of the agrophytocenoses and correction of technologies in agricultural crops cultivation in various

weather conditions (PC-2);

- the possession of programming methods in the yields of field crops for various levels of agricultural technology (PC-3);
- the readiness to apply diverse methodological approaches to modeling and designing of varieties, crop protection, techniques and technologies of crop production (PC-5);

the willingness to use modern achievements of world science and advanced technology in research projects of a graduate (PC-9);

The content of the subject covers a range of issues connected with modeling and design of agro ecosystems.

Subject teaching provides the following forms of the educational process organization: practical training, independent work of the student, consultation.

The subject program provides the following types of control: current control of progress in the form of questioning and interviews on the practical training, tasks in writing, the intermediate testing according to the main sections of the course and intermediate control in the form of test.

The total subject mastering workload is 3 credits, 108 hours. The subject program provides practical classes (22 hours) and independent work of the student (86 hours).

History and methodology of Pedology, Agro chemistry and Ecology

Annotation

The subject “History and methodology of pedology, agro chemistry and ecology” is the part B1 of subjects cycle for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the institute of Agro-ecological technologies by the chair of Pedology and agro chemistry.

The subject is aimed at formation of common cultural competences:

- to use the scientific achievements propaganda methods (GC-5);

The subject is aimed at formation of General professional competences:

- the ability to understand the essence of modern problems of Soil Science, Agro chemistry and Ecology, modern soil fertility reproduction technologies, scientific and technological policy in the field of environmentally safe agricultural products (GPC-3);

- the ability to independently carry out scientific research in soil science, agro chemistry and agroecology and apply scientific achievements in agricultural production (GPC-4);

The subject is aimed at formation of Professional competences:

- to use a variety of methodological approaches to the design of agricultural technologies and agro ecosystem modeling, optimization of soil conditions, fertilizer application systems for various crops (PC-6);

Contents cover the range of issues related to the history and methodology of soil science, agricultural chemistry and ecology. Particular attention is given to the biosphere and the ecological functions of soil, the transformation of soil under the

influence of anthropogenesis, the new approach to soil ecology, one of the main components of the biosphere, soil resilience to exogenous shocks.

Subject teaching provides the following forms of the educational process organization: lectures, seminars, colloquiums, independent work, essays, and consultations.

The subject program provides the following types of control: current control of progress in the form of seminars and intermediate control and intermediate control in the form of exam.

The total subject mastering workload is 3 credits, 108 hours. The subject program provides lectures (14 hours), classes (14 hours) and independent work of the student (44 hours), exam (36 hours).

Innovation technologies in the soil science, agricultural chemistry and ecology

Annotation

The discipline “Innovative technologies in soil science, agricultural chemistry and ecology” refers to the base of the professional cycle disciplines Master degree Curriculum in the field 35.04.03 “Agro chemistry and agro soil science”. The discipline is implemented at the Institute of Agro-ecological technologies by the chair of Soil science and agricultural chemistry.

The discipline focuses on the formation of general cultural competence:

- the ability to independently acquire with the help of information technology and to use new knowledge and skills in practice, including new areas of knowledge that are not directly related to the scope of activities.

Contents cover a range of issues related to the basic concepts and steps of the process of innovative design, the priority directions of innovation in soil science, agricultural chemistry and ecology.

The main topics are:

- 1 - the general understanding of the innovation process;
- 2 - priorities in soil science;
- 3 - the priorities in agricultural chemistry and ecology.

Teaching of discipline provides the following forms of organization of educational process: lectures, laboratory sessions, seminars, independent work.

The program includes the following forms of control: monitoring of progress in the form of oral questioning, final control.

The total subject mastering workload is 3 credits (108 hours). The program provides the discipline lectures (12 hours), laboratory works (36 hours) and independent work of the student (60 hours).

Instrumental methods of research

Annotation

The course “Instrumental methods of research” is a part of professional cycle of disciplines for Master degree students training in the field 35.04.03 “Agro

chemistry and agro soil science”. The discipline is implemented at the Institute of Agro-ecological technologies by the chair of Soil science and agro chemistry.

The discipline is aimed at formation of general cultural competences:

- the ability to improve and develop the intellectual and common cultural level;
- capacity for independent learning with the new methods of research to change scientific and industrial profile of the professional activities; the ability to use in practice skills in organizing research and project works in the management team;
- the ability of professional operation of modern equipment and instruments;
- possession of methods of propaganda of scientific achievements.

Professional competences of the graduate:

- the ability to understand the essence of the contemporary problems of agronomy, scientific and technical policy in the field of production of safe agricultural products;
- possession of methods of assessment of the agrophytocenoses and correction of technologies of agricultural crops cultivation in various weather conditions;
- the ability to assess the suitability of land for crops cultivation taking into account the production of quality products.

The content of the discipline covers a range of issues associated with inorganic chemistry, physics and mathematics.

Teaching discipline provides for the following forms of organization of educational process: laboratory work, seminars, independent work, consultations.

In the discipline teaching, the following types of control are used: current control of progress in the form of testing and intermediate control in the form of the testing.

The total subject mastering workload is 4 credits, 144 hours. Discipline implementation includes the laboratory work (32 hours) and independent work of the student (102 hours).

Methods, methodology and organization of the research

Annotation

The subject “Methods, methodology and organization of the research” is the variable part of the General scientific cycle of disciplines for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science” which is implemented in the Institute of Agro-ecological technologies at the chair of Soil science and agro chemistry.

The discipline is aimed at the formation of general cultural competences of the graduate student:

OK-1 – ability for abstract thinking, analysis, synthesis;

OK-5 – possession of methods of the scientific achievements promotion;

General professional competences of a graduate student are as follows:

OPC-3 – ability to understand the essence of modern problems of agro soil, agro chemistry and ecology, modern technologies of reproduction of the soils fertility, scientific and technological policy in the field of ecologically safe agricultural products;

Professional competencies are as follows:

PC-1 – the ability to set goals, to choose methods of research.

The content of the discipline covers a range of issues related to the methodology of scientific creativity, research and methods of research, methods of data processing and presentation. The discipline provides the following organizational forms of educational process: practical classes, including seminars, independent work.

Program of the discipline provides for the following types of control: current control of progress in the form of oral questioning, seminars and an intermediate control in the form of questioning.

The total subject mastering workload is 3 credits, 108 hours: practical classes (30 hours), independent work of the student (78 hours).

Technique and methodology of teaching in higher education

Annotation

Discipline is part of Block 1 (Discipline (modules) in the Curriculum in the field 35.04.03 “Agro chemistry and agro soil science”. Discipline is implemented at the Institute of Agro-ecological technologies.

One of the areas of professional activity for Master degree student is teaching activities in institutions of higher and secondary vocational education, which implies the possession of the fundamentals of pedagogical activity, the ability to solve professional tasks in the development of educational programs and teaching materials and in the teaching of agricultural subjects.

This discipline involves the integration of knowledge about the art of training and education, creativity, self-development and self-realization abilities, mastering the communicative skills, progressive pedagogical interaction of technologies and management skills in teaching. So in the course of studying the discipline a significant place is given to active forms and methods of training.

The objectives of the development of the discipline are:

- to contribute to the establishment and development of the core competencies of the university of the future teachers in the Higher School of Pedagogy;
- to form the personality of graduates general and pedagogical culture, creative approach to reality;
- to form the knowledge of the essence of teaching activities and the components of pedagogical skills and understanding of its implications for the education and training of fully developed and competitive personality of future professional;
- to master the methods to stimulate active cognitive and developmental activities of students;
- to master technology of pedagogical interaction organization.

The discipline focuses on the formation of the following competencies:

- willingness to act in unusual situations, bear social and ethical responsibility for decisions;
- willingness to communicate in oral and written forms in Russian and foreign languages to meet the challenges of professional activity;
- readiness to lead the team in their professional activities, tolerant perceiving social, ethnic, religious and cultural differences.

Teaching discipline provides the following forms of organization of the educational process: lectures, practical classes, consultations, independent work of students.

The program includes the following discipline forms of control: monitoring of progress in the form of testing and monitoring in the form of an interim examination.

The total subject mastering workload is 3 credits, 108 hours. Program of the discipline provides lectures (12 hours), practical classes (12 hours), and independent work of the student (48 hours). The study of the subjects is provided in the 2nd semester and ends with the exams.

History and philosophy of science

Annotation

The subject “History and philosophy of science” is a part of the general cultural subject cycle in the training of Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is implemented at the Institute of Agro-ecological technologies by the Philosophy chair.

The subject is aimed at formation of common cultural competencies (1, 5). The content of the subject covers a range of issues related to problems of the history of science and its philosophical understanding. The subject teaching provides for the following forms of organization of educational process: lectures, practical classes, colloquiums, independent work.

The program of the subject provides for the following types of control: current control of progress in the form of colloquiums, tests, summaries, and intermediate control in the form of questioning.

The total subject mastering workload is 3 credits, 108 hours. The subject program provides classroom instruction: lectures (14 hours), practical classes (14 hours) and independent work of the student (88 hours).

Monitoring of the environment

Annotation

The subject “Monitoring of the environment” is the part of the professional cycle of Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the Institute of Agro-ecological technologies by the chair of Agro ecology and management of natural resources.

The subject is aimed at formation of professional competences (PC-1, PC-2, PC-3, PC-5, PC-12) of the graduate.

The content of the discipline covers a range of issues related to the study of pollutants in the biosphere, monitoring and its classification, legal framework of monitoring.

Subject teaching provides the following forms of the educational process organization: lectures, practical training, seminars, colloquiums, independent work of the students, consultations.

The subject program provides the following types of control: current control of progress in the form of colloquium and intermediate control in the form of testing.

The total subject mastering workload is 2 credits, 72 hours. The subject program provides lectures (11 hours), practical classes (11 hours), and independent work of the student (50 hours).

Soils of Siberia

Annotation

The subject “Soils of Siberia” is a variable part of compulsory subjects for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. This subject is implemented by chair of Pedology and agro chemistry in the Institute of Agro-ecological technologies.

The subject is aimed at formation of general cultural, general professional and professional competences of graduates.

The subject content covers the range of topics devoted to evaluation of functions features and soils fertility condition of a large Siberian region Krasnoyarsk Territory. The soil cover of Krasnoyarsk region is characterized by diversity, specificity and sharp territorial homogeneity. It is caused by the complexity of natural-ecological conditions and originality of natural geosystems. Specific features of regional soils are scientifically proven and reasonable. They are isolated as provincial soil properties that define a controversial decision about their use in agriculture. Numerous publications and available database “Soils of Krasnoyarsk Territory” is the basis for analysis of genetic, physical-chemical properties and features of territorial soils and for fertility definition of agricultural soils that allows the typing of soils resources according to production capacity of their use.

There are the following forms of education process: laboratory works including seminars and self-study.

There are the following types of control: current control in the form of oral questioning and taking of laboratory, seminars task and intermediate control in the form of exam.

The total workload of the subject is 3 credits, 108 hours: classroom (24 hours), laboratory classes (24 hours), independent work of the student (84 hours), credit.

Soil resistivity

Annotation

The subject “Soil resistivity” is the variable part of a professional cycle of subjects of Master degree students training in the field 35.04.03 “Agro chemistry and

agro soil science” which is implemented at Institute of Agro-ecological technologies by the chair of Soil science and agro chemistry.

The subject is aimed at the development of:

common cultural, all-professional and professional competences of the graduate – mastering of physical, chemical and biological methods of soil fertility assessment of agro-landscapes, readiness to apply various methodological approaches to modeling and design of agro ecosystems, optimization of soil conditions, reproduction of soils fertility, abilities to prove an optimum way of the soils use, means of chemicalization and mechanization for obtaining economic and ecological efficiency.

The subject content covers a number of the issues included into problem and concept of resistance of the soil to anthropogenous influences. Understanding of a global role of soils (pedosphere) in the biosphere and society caused emergence of the theoretical and practical works showing regularities of natural and anthropogenous evolution of a soil cover. Broad development of soils degradation in the conditions of the accruing anthropogenous influence determines measures for soils and a soil cover protection for natural mechanisms support of the biosphere and living conditions of the person functioning, and also sets a task of such technologies development of impact on the soil which provides long-term use without negative consequences. Ensuring ecological stability of soils and agro-landscapes, in general, is considered as a key problem of land resources use.

Subject teaching provides the following forms of the educational process organization: lectures, laboratory research (including seminars), independent work, consultations.

The subject program provides the following types of control: the current control of progress in the form of oral interview, testing, seminars and intermediate control in the form of examination.

The total subject mastering workload is 4 credits, 144 hours, including: in-class studies (24 hours): lectures (8 hours), laboratory research (16 hours), independent work of the student (84 hours), examination (36 hours).

Soil properties and modes

Annotation

The subject “Soil properties and modes” is the part B1 of subjects cycle of Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the Institute of Agro-ecological technologies by the chair of Pedology and agro chemistry.

The subject is aimed at formation of common cultural competences:

- methods of the scientific achievements propaganda (GC-5);
- The ability to understand the essence of modern problems of Soil Science, Agro chemistry and Ecology, modern soil fertility reproduction technologies, scientific and technological policy in the field of environmentally sound agricultural products (GPC-3);

- physical, chemical and biological methods to assess soil fertility and quality of agricultural products (PC-2).

Contents cover a range of issues related to the study of natural, water-physical and chemical properties of the soil; water, air, heat and soil redox conditions and methods for their control. The main section of the course concerns the soil conditions and methods for their control.

Subject teaching provides the following forms of the educational process organization: (lectures, laboratory classes, seminars, independent work of the student).

The subject program provides the following types of control: current control of progress in the form of seminars and intermediate control, and intermediate control in the form frontal questioning and seminar, final control in the form of set-off (test) with the assessment.

The total workload of subject mastering is 3 credits, 108 hours. The subject program provides, lectures (12 hours), laboratory exercises (24 hours) and independent work of the student (72 hours).

Ecological expertise of lands

Annotation

The subject “Ecological expertise of lands” is included into the Unit 1 of subjects (modules) of variable part of obligatory subjects of Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the institute of Agro-ecological technologies by the chair of Soil science and agro chemistry.

The discipline is aimed at common cultural (OK-1), common professional (OPC-3), professional (PC-7) competences development of the graduate.

Subject content covers a range of issues connected with land use ecology fundamentals, assessment and expertise of soils and lands, the role of soils properties, soil modes in soils quality and the value of lands formation.

Subject teaching provides the following educational process organization forms: lectures laboratory works, seminars, independent work of a student, consultations.

The subject program provides the following types of control: the current control of progress in the form of questioning, tests, tasks solutions, colloquiums and seminars and intermediate control in the form of tests.

The total subject mastering workload is 5 credits, 180 hours. The subject program provides lectures (10 hours), laboratory works (20 hours) and independent work of the student (114 hours).

Geo-information systems in agricultural chemistry, soil and environmental management

Annotation

The subject “Geo-information systems in Agricultural Chemistry, Soil and Environmental management” is a part of the mathematical and natural Sciences disciplines for of Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. Discipline is taught at the Institute of Agro-ecological technologies at the chair of Soil science and agro chemistry.

The content of the discipline covers a range of issues related to the history and methodology of geo-information systems, their functions, introduction to popular GIS platforms, such as MapInfo, ArcGIS, GIS-IDRISI, etc., with applications of mathematical analysis and modeling, with the applied interpretation of the final results in the field of ecology and environmental sciences.

The discipline teaching provides the following forms of the organization of educational process: lectures, practical studies, seminars, and independent work.

The program provides the following types of control: the current control of progress in the form of dialog, an interim control in the form of differentiated credit.

The total subject mastering workload is 3 credits, 108 hours. The program of the discipline of the course includes lectures (18 hours) practical classes (36 hours), independent work of the student (54 hours).

Protection of intellectual property

Annotation

The subject “Protection of intellectual property” is part 1 of the block of the base part of the elective courses to prepare Master degree students in the field 35.04.03 “Agro chemistry and agro soil science”.

The subject is taught at the Institute of Agro-ecological technologies by the chair of Personnel management.

The subject “Protection of intellectual property” is the foundation for students’ orientation in the field of intellectual property; it establishes a framework of knowledge on the protection of intellectual property. Competences acquired by students during the study of this subject can be used to assess the patentability and commercial potential of intellectual property and the ability to properly manage the intellectual property portfolio on high-tech enterprises.

Teaching of the subject provides for the following forms of organization of educational process: practical training, independent work of students, consultation.

Program of subject provides for the following types of control: current and intermediate control of students’ progress in the form of tests and final control in the form of credits.

The total subject mastering workload is 2 credits, 72 hours. Subject program provides practical classes (20 hours), independent work of the student (52 hours).

Place of subject in the educational process

The subject “Protection of intellectual property” is an elective subject of the base part 1 of the unit. This subject provides the required minimum of knowledge for the professional activity of the Master.

Innovation management

Annotation

The “Innovation management” discipline purposes are the training of the highly qualified specialists capable on the basis of the gained knowledge to develop practical skills of management of development processes and realization of innovations – the major factor of development of economy of modern society; formation at future experts of modern ideas of innovative nature of business in the production sphere, features and mechanisms of innovative activity. Innovative management is one of the main special disciplines, allows to train future expert having the high level of theoretical knowledge in the field of management, necessary further for profound studying of other disciplines and for successful practical application. Need of studying of this discipline is dictated by requirements of market economy in the conditions of which effective activity is based on intensive factors of economic growth.

The total subject mastering workload is 2 credits, 72 hours. Discipline Program provides practical training (20 hours) and independent work of the student (52 hours).

1. Requirements for a subject

1.1. Inner and outer requirements

Discipline “Innovation Management” is included in the training of Master degree students in the field 35.04.03 “Agro chemistry and agro soil science”.

It is the elective discipline.

Implementation of the discipline “Innovation Management” should form the following competence: ability to possession of innovative processes in agrarian and industrial complex and use of them in the design and implementation of environmentally sound technologies in crop production and soil fertility (PC-6);

The total subject mastering workload is 2 credits, 72 hours. Discipline Program provides practical training (20 hours) and independent work of the student (52 hours).

1.2. Place of a subject in the academic process

Discipline “Innovation Management” is studied in the first year, involves preparing students for professional activities related to the implementation and diffusion of innovation, as well as the search for innovative solutions to technical maintenance of production (services) with regard to quality requirements and cost, as well as deadlines, security life and environmental cleanliness.

The learning process includes practical classes, conducting business games.

Control Master of knowledge is held in the form of current and interim assessment, final control - test.

Ecological soil science

Annotation

Discipline “Ecological soil science” is the elective discipline for training of Master degree students in the field 35.04.03 “Agro chemistry and agro soil science”, which is implemented in the Institute of Agro-ecological technologies by the chair of Soil science and agricultural chemistry.

The discipline focuses on the formation of general cultural, general professional and professional competences necessary for creative and competent use of knowledge in productive activities.

Introduction of the course “Ecological soil science” contains planetary role of soil in the world, its global environmental functions, change and deterioration of the soil under the influence of human activities as an important environmental issue of our time. Formulation of the problem underlines the crucial importance of soil resources, requires a broader approach to the science of soils, stimulates basic research to establish the nature of relationships between soil properties and the answers to the many “why” with respect to these dependencies. It is becoming increasingly clear that the search for new facts and laws of the world's soils requires new knowledge. The proposed course for masters shows soil in the biosphere, ecosystems and the role of its components in the formation of soil, stands out ecological functions of soil, highlights the interaction and interdependence of soil components, relations, and soil conditions of functioning.

Teaching of discipline provides the following forms of organization of educational process: practical classes, seminars, test, independent work, consultations.

The program includes the following discipline control: oral questioning, testing, seminars, the defence of the tasks and intermediate control in the form of test.

The total subject mastering workload is 2 credits, 72 hours: practical and seminars (10 hours), independent work of the student (62 hours).

Bio diagnostics

Annotation

Discipline “Bio diagnostics” is included in Block 1 Discipline (modules) of the variable part for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. Discipline is implemented at the Institute of Agro-ecological technology by the chair of Agro chemistry and pedology.

Discipline is aimed at creating the general culture competence (GCC-1), general professional competence (GPC-4), professional competence (PC-2) of the graduate. Contents of discipline cover a range of issues related to bio-based diagnostics and indication of soil as well as soil properties and processes; the role of soil properties, soil conditions in the formation of the biological properties of soils.

Discipline provides the following forms of organization of educational process: practical training, self-study training of students, consultations.

The program includes the following forms of discipline control: monitoring of progress in the form of answers to questions, and intermediate control in the form of the test.

The total subject mastering workload is 3 credits, 108 hours. Discipline Program provides practical training (12 hours) and independent work of the student (96 hours).

System of rational use and protection of land resources

Annotation

The discipline “System of rational use and protection of land resources” is a part of a cycle of elective courses for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”.

The discipline focuses on the formation of professional competences: PC-6, PC-7, PC-8, PC-9, PC - 13.

The content covers a range of issues related to the legal framework of rational use and protection of land resources.

The teaching of the discipline provides the following forms of organization of the educational process: lectures, tutorial, students’ independent work.

The program of the discipline provides the following types of control: current control in the form of testing and final control in the form of the final test.

The total subject mastering workload is 3 credits, 108 hours. The program of the discipline provides: lectures (11 hours), laboratory classes (33 hours), and independent work of the student (64 hours).

Modern technologies in crop research

Annotation

The discipline is implemented at the Institute of Agro-ecological technologies, by the chair of Crop research and horticulture.

The discipline is aimed at formation of professional competences of the graduates (GPC – 3, GC – 4, PC – 4).

The content of the discipline covers a range of issues related to the study of all aspects of life, in particular, the structure of agricultural production in modern conditions.

The strategic aim of the course has the social focus. This discipline contributes to the training of Masters - qualified professionals to meet the challenges of ensuring food security in the region.

Environmental issues are being solved parallel – reduction of erosion processes on the soil by growing crops according to modern technologies considering the weed plants in cenosis; reductions in using chemical fertilizers and means of plant protection through the cultivation of leguminous crops, accumulating atmospheric nitrogen.

Previous courses are botany, soil science, agricultural chemistry, plant physiology, general agriculture and plant protection.

This discipline is the final one and summarizes all agronomic disciplines. The peculiarity of the discipline is that it provides answers to all previously incurred

questions in the course of the training, and first of all – why we need modern agriculture.

Control of students' knowledge is conducted in the form of current and intermediate-term assessment in the form of implementation of control works for 1 hour duration. The course ends with a final credit.

The total subject mastering workload is 3 credits, 108 hours. The subject program provides: lectures (10 hours), laboratory exercises (30 hours) and independent work of the student (68 hours).

Soil monitoring Annotation

The subject “Soil monitoring” is the part B1 of subject cycle for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the institute of Agro-ecological Technologies by the chair of Pedology and agro chemistry.

The subject is aimed at formation of common cultural competences:

- methods of the scientific achievements propaganda (GC-5);
- The ability to understand the essence of modern problems of Soil Science, Agro chemistry and Ecology, modern soil fertility reproduction technologies, scientific and technological policy in the field of environmentally sound agricultural products (GPC-3);
- physical, chemical and biological methods to assess soil fertility and quality of agricultural products (PC-2).

Contents cover a range of issues related to the study of natural, water-physical and chemical properties of the soil; water, air, heat and soil redox conditions and methods for their control. The main section of the course concerns the soil conditions and methods for their control.

Subject teaching provides the following forms of the educational process organization: (lectures, laboratory classes, seminars, independent work of the student).

The subject program provides the following types of control: current control of progress in the form of seminars and intermediate control and intermediate control in the form frontal questioning and seminars, final control in the form of set-off (test) with the assessment.

The total subject mastering workload is 3 credits, 108 hours. The subject program provides: lectures (12 hours), laboratory exercises (24 hours) and independent work of the student (72 hours).

Theory of soil formation process Annotation

The discipline “The theory of soil formation process” is included in GEP, and belongs to elective disciplines for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”.

The mastering of the discipline “The theory of soil formation process” according to the requirements of FSES HE and the curriculum of the field 35.04.03 “Agro chemistry and agro soil science” has to form the following general cultural competences of the graduate:

GC-1 – abilities to abstract thinking, analysis, synthesis;
general-professional competences of the graduate:

GPC-3 – abilities to understand essence of modern problems of agrology, agricultural chemistry and ecology, modern technologies of reproduction the fertility of soils, scientific and technical policy in the field of ecological safe agricultural production;

professional competences of the graduate:

PC-2 – skills of physical, chemical and biological methods of an assessment the soil fertility and quality of agricultural production.

Place of a subject in the academic process

The discipline “The theory of soil formation process” is included in GEP, as the elective discipline and belongs to variable part of disciplines for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”.

For full mastering of this discipline by Masters it is necessary to have knowledge on geology, physics, biology and geobotany, climatology, geomorphology, geochemistry, mathematics, the general organic and physical and colloidal chemistry, microbiology, ecology, fundamentals of soil science (within a bachelor degree course). The discipline “The theory of soil formation process” creates the necessary base for successful development by Masters of the subsequent disciplines provided by the curriculum. The place of discipline within the Master training is a base of knowledge for experimental data processing and working out of the Master thesis, and also for the organization of individual work at educational and scientific process.

Studying of discipline is directed towards knowledge acquisition for mastering common cultural, common professional and professional competences about soils origin, distribution and evolution, conceptual bases of soil processes management for the purpose of optimization the soil properties and increasing their fertility.

Skills to master:

- ability to identify soil and landscape relations and to group soils according to modern classification;
- ability to estimate the soil formation factors defining soil profile formation directions;
- to make an assessment of soils properties and signs, created as a result of elementary soil formation processes;
- readiness to study modern scientific literature on scope of research;
- ability to carry out morphogenetic and analytical research of soils according to the approved techniques.

Legal regulation of land evaluation

Annotation

The discipline “Legal regulation of land evaluation” is part of a cycle of elective courses for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”.

The discipline focuses on the formation of professional competences: PC-6, PC-7, PC-8.

Contents cover a range of issues related to the legal framework of the market and cadastral land evaluation.

The teaching of the discipline provides the following forms of organization of the educational process: tutorial, students’ independent work.

The program of the discipline provides the following types of control: current control in the form of control test and final control in the form of test.

The total subject mastering workload is 2 credits, 72 hours. The program of the discipline provides laboratory classes (18 hours), and independent work of the student (54 hours).

Management of soil fertility

Annotation

The work program is drawn up on the basis of the Federal State Standard of higher education and the curriculum of the field 35.04.03 “Agro chemistry and agro soil science”, profile “Soil-ecological monitoring”.

Discipline “Management of soil fertility” is an elective discipline of the block B1 disciplines (modules) of curriculum (B1.V.DV.5) for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. Discipline is implemented at the Institute of Agro-ecological technologies, by the chair of Soil Science and Agricultural Chemistry.

The discipline is aimed at developing the following competencies:

-the ability for abstract thinking, analysis and synthesis (GC-1);

-readiness to make practical recommendations for the use of research results (PC-7);

-the ability to prove the best way of land use, application of chemicals and mechanization to achieve the greatest economic and environmental efficiency (PC-8).

Contents cover the range of issues associated with the study of the categories, the factors and conditions of soil fertility; crops in soil conditions; the main forms of land degradation and evaluation of soil resources. The studied discipline touches upon the issues of soil humus condition regulation, water and physical properties, absorbency, food regime and erosion control.

Teaching of discipline provides the following forms of organization of educational process: laboratory classes, seminars, and independent work.

The program includes the following forms of control: oral questioning and testing, the final control in the form of test.

The total subject mastering workload is 3 credits, 108 hours. The program provides the discipline with laboratory classes (16 hours) and independent work of the student (92 hours).

Recultivation and bioremediation of soils and lands

Annotation

The subject “Recultivation and bioremediation of soils and lands” is the part of choice of general scientific cycle of subjects cycle for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the Institute of Agro-ecological technologies by the chair of Soil Science and Agro chemistry.

The subject is aimed at formation of common cultural competences GPC-3 (the ability to understand the essence of modern problems of Soil Science, Agro chemistry and Ecology, modern soil fertility reproduction technologies, scientific and technological policy in the field of environmentally friendly agricultural products), professional competences PC-2 (possession of the physical, chemical and biological methods to assess soil fertility and quality of agricultural products), PC-4 (willingness to use modern achievements of science and advanced technologies in innovative projects), PC-6 (willingness to use a variety of methodological approaches to the design of agricultural technologies and agro-ecosystem modeling, optimization of soil conditions, systems, application of fertilizers for different crops) of an graduate.

The content of a subject covers a range of issues connected with land rehabilitation and soil remediation, including: purposes of land rehabilitation and soil remediation; general approaches to land rehabilitation and soil remediation; technical and biological methods of land rehabilitation; technical and biological methods of soil remediation.

Subject teaching provides the following forms of the educational process organization: lectures, laboratory works and independent work of the student.

The subject program provides the following types of control: current control of progress in the form of testing and intermediate control in the form of test.

The total subject mastering workload is 3 credits, 108 hours. The subject program provides lectures (14 hours), laboratory exercises (28 hours) and independent work of the student (66 hours).

As a result of a subject studying a student should:

Know:

Purposes of land rehabilitation and soil remediation, general approaches to land rehabilitation and soil remediation, list of technical and biological methods for land rehabilitation and soil remediation.

Be able to:

Choose an appropriate method for land rehabilitation and soil remediation in any given situation.

Master:

Basic technical and biological methods of rehabilitation and bioremediation of soils and lands, including remediation using microorganisms, remediation using invertebrates and phytoremediation.

Mathematical Methods in the Soil Science and the Agro chemistry

Annotation

The subject “Mathematical Methods in the Soil Science and the Agro chemistry” is the part of choice of general scientific cycle of subject cycle for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The subject is taught at the Institute of Agro-ecological technologies by the chair of Soil Science and Agro chemistry.

The subject is aimed at formation of common cultural competence GC-4 (the ability to independently acquire using information technologies and to apply in practical activity new knowledge and skills, including new areas of expertise, which are not directly related to the scope of activity), professional competences PC-5 (ready to present the results in the form of reports, papers, publications and public discussions) and PC-6 (willingness to use a variety of methodological approaches to the design of agricultural technologies and agro-ecosystem modeling, optimization of soil conditions, systems, application of fertilizers for different crops) of the graduate.

The content of a subject covers a range of issues connected with data analysis, data mining and mathematical modeling, including: Basic Statistics; Statistical Hypothesis Testing; Multivariate Exploratory Techniques using Cluster Analysis, Principal Component Analysis, Factor Analysis, Discriminant Analysis; Regression Modeling and Modeling with Differential Equations.

Subject teaching provides the following forms of the educational process organization: lectures, laboratory works and independent work of the student.

The subject program provides the following types of control: current control of progress in the form of testing and intermediate control in the form of test.

The total subject mastering workload is 4 test units, 144 hours. The subject program provides lectures (24 hours), laboratory exercises (24 hours) and independent work of the student (96 hours).

As a result of a subject studying a student should:

Know:

Basic methods of data analysis, data mining and mathematical modeling for Soil Science and Agro chemistry.

Be able to:

Choose an appropriate method for data analysis and/or mathematical modeling in any given situation.

Master:

Microsoft Excel Analysis Tool Pack and Stat Soft STATISTICA.

Digital Cartography of Soil

Annotation

The discipline “Digital soil cartography” is an elective course of the curriculum for Master degree students training in the field 35.04.03 “Agro chemistry and agro soil science”. The discipline is realized at institute of Agro-ecological technologies by the chair of Soil science and agro chemistry.

The discipline is aimed at formation of common cultural competences (ability to acquire knowledge independently by means of information technologies and to use

new knowledge and abilities in practical activities), professional competences (readiness to use information technologies and systems in the professional activity).

Content of discipline includes a range of the issues connected with the history and methodology of expected soil mapping; structure and contents of the soil database; the doctrine about structure of a soil cover and methods of creation of soil cards on an electronic basis. Course primary partitions: 1 – Theoretical fundamentals of digital soil cartography; 2 – Application of digital methods in case of large-scale mapping.

“The digital cartography of soil” is very tightly accompanied by discipline of “GIS-technology”; classes within these courses are conducted parallel.

Teaching discipline provides the following forms of the organization of educational process: lectures, laboratory researches, master - classes, individual works.

The program of discipline provides the following types of control: the current monitoring of progress in the form of oral control, the intermediate monitoring in the form of credit.

The total subject mastering workload is 2 credits, 72 hours. The program of discipline provides lectures (10 hours) laboratory research (22 hours), independent work of the student (40 hours).