



UNIVERSITATEA DE ȘTIINȚE AGRICOLE ȘI MEDICINĂ VETERINARĂ CLUJ-NAPOCA

Facultatea de Agricultură

Calea Mănăștur 3-5, 400372, Cluj-Napoca, România

Tel: 0264-596.384, Fax: 0264-593.792

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USAMV
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No. _____ of _____

USAMV form 0101020215 (discipline code)

SUBJECT OUTLINE

1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca
1.2. Faculty	Agriculture
1.3. Department	Technical Sciences and Soil Sciences
1.4. Field of study	Agronomy
1.5. Cycle of study ¹	Bachelor
1.6. Specialization/ Study programme	Agriculture / 4 years
1.7. Form of education	Full-time

2. Information on the discipline

2.1. Discipline name	AGROCHEMICAL MAPPING							
2.2. Course coordinator	Prof. PhD Mărghitaș Marilena							
2.3. Seminar/ laboratory/ project coordinator	Lecturer PhD Pop Tiberia Ioana							
2.4. Year of study	II	2.5. Semester	I	2.6. Evaluation type	continuous	2.7. Discipline status	Content ²	DD
							Compulsoriness ³	DI

3. Total estimated time (teaching hours per semester)

3.1. Hours per week - full time programme	4	out of which: 3.2. lecture	2	3.3. seminar/ laboratory/ project	2
3.4. Total number of hours in the curriculum	56	out of which: 3.5. lecture	28	3.6. seminar/ laboratory	28
Distribution of the time allotted					hours
3.4.1. Study based on books, textbooks, bibliography and notes					20
3.4.2. Additional documentation in the library, electronic platforms and field experiences					15
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					15
3.4.4. Tutorials					4
3.4.5. Examinations					10
3.4.6. Other activities					
3.7. Total hours of individual study	34				
3.8. Total hours per semester	90				
3.9. Number of credits ⁴	3				

4. Prerequisites (if applicable)

4.1. curriculum-related	Mathematics, Chemistry, Pedology, Botany, Biochemistry, Biophysics and Agrometeorology, Plant Mathematics, Chemistry, Pedology, Botany, Biophysics and Agrometeorology, Economics, Biochemistry, Ecology, Plant Physiology, Agrochemistry, Agrotechnics, Phytotechnics, Vegetables, Pomiculture, Viticulture, Floriculture, Fodder Cultures, Phytotechnology, Entomology
4.2. skills-related	The student must have theoretical knowledge regarding the agroecosystem, environmental factors and the measures exercised by humans on them, because the bioproductivity of agroecosystems depends on climatic, nutritional, biological and socio-economic factors (management).

5. Conditions (if applicable)

5.1. for the course	The course is interactive, students can ask questions about the content of the lecture. The university subject requires the observance of the starting and finishing time of the lecture. No other activities are tolerated during the lecture, the cell phones must be closed.
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5.2.for the seminar/ laboratory/ project	During the practical laboratory work, the presence of the specialized teacher in the agrochemical field and her consultation during the agrochemical analysis is mandatory. Each student will carry out an individual activity with the laboratory materials provided and described in the procedures and laboratory guide. Academic discipline is imperative during the agrochemical laboratories and field work.
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6. Cumulated specific competences

Professional competences	<p>To know the characteristics and the functioning of the bioproductivity of agroecosystems and the necessity of carrying out agrochemical mapping in agricultural farms for the evaluation of soil fertility and quality;</p> <p>To understand the theoretical principles and practical measures that underlie the knowledge of agrochemical resources and the management of their use in agriculture, in the conditions of agrochemical optimization of agroecosystems and obtaining higher agricultural and horticultural productions, as well as their profitability;</p> <p>To acquire solid knowledge in the activity of agrochemical monitoring of soil and use of natural and mineral organic resources. To establish correctly the management of land and fertilization of the agricultural and horticultural systems, the good agricultural practices of the farm, the respect for nature and biodiversity (the ecological management, the management of breeding and animal care) according to the proposed EU strategy for the development of rural space, implementation of measures of mountain areas development, strengthening of specific management of rural areas, development of villages and their evolution towards modern civilization;</p>
Transversal competences	<p>To demonstrate the ability to interpret agrochemical mapping and to characterize the main agrochemical indices underlying the rational fertilization of plants and the main natural and mineral organic resources applied in sustainable agriculture systems;</p> <p>To acquire the students' theoretical knowledge based on the use of fertilizers and amendments to agricultural and horticultural crops as well as the economic and ecological basis of fertilizer consumption in agriculture and horticulture for the sustainable increase of soil fertility and maintaining ecological balance in existing agroecosystems;</p> <p>To be able to monitor the main agrochemical factors of differentiation of nutrient doses for plants in order to achieve rational and efficient fertilization in increasing soil fertility and productivity and higher quality and quantitative plant productions that ensure food safety and security;</p> <p>To be able to determine the economic efficiency of the soil-plant-fertilizer system at different agricultural crops;</p> <p>To participate in the activities of agrochemical monitoring of soils and the research program of the nutrition of plant species and the management of nutrients and fertilizers of Agrochemistry.</p>

7. Discipline objectives(based on the cumulated specific competences)

7.1. General objective	<p>Training the students on the complete agrochemical study of soils (Agrochemical Mapping) based on soil analyzes, performed and repeated cyclically, on the way of carrying out the mapping (practically in the field and laboratory) and on the interpretation of results;</p> <p>Acquisition of the methodology of drawing the mapping (Cartograms), of the plans and programs of amending and fertilizing;</p> <p>Knowing ways of determining the agrochemical optimization of the soil-plant system, the sustainable increase of soil fertility status and maintaining the ecological balance in the existing agroecosystems.</p>
7.2. Specific objectives	<p>To know the phases of agrochemical mapping: the preparatory phase with the interpretation of the topographic and pedological maps (with the soil classes and units) in order to take the samples and establish the dimension of agrochemical plots; the field phase with the adaptation of sampling to the soil pedological units, the level of the chemization, the agricultural-horticultural uses and the structure of the crops; the laboratory phase: sample preparation and analysis procedures: - large series analysis: pH, V%, PSA, In, P, K; - small series analyzes: humus, Al-mobile, Na-exchangeable, other macroelements (S, Ca, Mg), microelements (Fe, Mn, Cu, Zn, B, Mo), special and synthetic indicators (IPC, IOFS, ICMg, IMo, etc); - interpretation and distribution of agrochemical surfaces according to the classes and the level of representation of the determined indices of fertility; office and mapping phase - drawing up and mapping of pH and V% index, with amending emergencies, N-chart, P-chart, K-chart; - preparation of the fertilization and amending program (doses, requirements in N, P, K, organic fertilizers and amendments); - elaboration of the synthetic cartogram with the structure of uses, cultures and doses of amendments and N, P, K; - elaboration of the scientific report with the main recommendations for fertilization and agrochemical improvement of the soil.</p> <p>To acquire practical and decision-making skills in the field for proper soil management and maintaining the ecological balance.</p>

8. Content

8.1. COURSE Number of hours -28	Teaching methods	Observation
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<p>Chapter 1. Fertility, productivity and soil quality. 1.1 Overview, definitions, concepts; 1.2. History of research on soil fertility control; 1.3. Organization of soil fertility control and monitoring.</p> <p>Chapter 2. Agrochemical methods for soil fertility control. 2.1. Overview; 2.2. Soil analysis; 2.3. Plant analysis; 2.4. Experiments with fertilizers and amendments; 2.5. Curves of biomass production and agrochemical nomograms; 2.6. Agrochemical mapping.</p> <p>Chapter 3. Agrochemical mapping - the agrochemical study of soils (component phases): 3.1. Preparatory phase: Interpretation of topographic and pedological maps (with soil classes and units) for sampling and sizing of agrochemical plots; 3.2. Field phase: adaptation of sampling to soil pedological units, level of chemization, agricultural-horticultural uses and crop structure; 3.3. Laboratory phase: methods of sample preparation and analysis: - large series analyzes: pH, V%, PSA, I_N, P, K; - small series analyzes: humus, Al-mobile, Na-exchangeable, other macroelements (S, Ca, Mg), microelements (Fe, Mn, Cu, Zn, B, Mo), special and synthetic indicators (IPC, IOFS, ICMg, IMo, etc); - interpretation and distribution of agrochemical surfaces according to classes and level of representation of fertility indices determinants. 3.4. Office and mapping phase: - drawing and mapping the the pH and V% index, with amendement emergencies, the N-chart, the P-chart, the K-chart; - drawing up the fertilization and amending programs (doses, requirements for N, P, K, organic fertilizers and amendments); - elaboration of the synthetic cartogram with the structure of uses, cultures and doses of amendments and N, P, K; - elaboration of the scientific report with the main recommendations for fertilization and agrochemical improvement of the soil.</p> <p>Chapter 4. Possibilities for improving the content of agrochemical mapping and studies in Romania. 4.1. Causes of current uncertainties in carrying out agrochemical mapping and studies; 4.2. Content problems in order to develop and deepen the activity of agrochemical studies.</p> <p>Chapter 5. Assessments related to soil studies and analyzes for agrochemical purposes in community countries.</p> <p>Chapter 6. Case studies of the use of mapping - agrochemical studies. 6.1. Agrochemical monitoring - an integral part of soil quality monitoring; 6.2. Achieving integrated nutrient and fertility management for sustainable agriculture; 6.3. Possibilities of deepening the phosphorus regime in soil through mapping - agrochemical studies; 6.4. Problems of using microelements in fertilization systems; 6.5. Organic soil matter - agrochemical evolution and involvement; 6.6. Agrochemical study of soils and vegetation polluted with heavy metals (Pb, Cd, Cu, Zn); 6.7. Diagnosis of negative nutrition and fertilization states; 6.8. Special agrochemical studies on soil contamination and nitrate vegetation.</p>	Lecture	1 lecture = 2 hours
	Lecture	2 lectures = 4 hours
	Lecture	2 lectures = 4 hours
		6 lectures = 12 hours
	Lecture	1 lecture = 2 hours
	Lecture	1 lecture = 2 hours
	3 lectures = 6 hours	

8.2. PRACTICAL WORKS Number of hours - 28	Teaching methods	Observation
1. Methods of soil fertility control - interpretation of objectives and results.	Laboratory	1lab= 2 hours
2. Computer drawing of the topographic and pedological maps in order to take soil samples, delimiting the agrochemical plots.	Laboratory	2lab= 4 hours
3. Collecting soil samples by differentiated uses, crops and technologies.	Laboratory	1lab= 2 hours
4. Interpretation of soil analyzes in order to establish the reaction and nutrient supply classes of soil. Calculation of the effective contribution of soil in accessible nutrients.	Laboratory	2lab= 4 hours
5. Preparation of agrochemical cartograms: pH, saturation degree in bases (V%) with delimitation of the surfaces, nitrogen, phosphorus, potassium and synthesis of agrochemical mapping.	Laboratory	3lab= 6 hours
6. Calculation of doses and the need for amendments, mineral and organic fertilizers.	Laboratory	3lab= 6 hours
7. Preparation of the agrochemical scientific memory.	Laboratory	1lab= 2 hours
8. Knowledge checking.	Laboratory	1lab= 2 hours

Compulsory bibliography:

1. Avarvarei I. șicolab., 1997, Agrochimie., Ed Sitech, Craiova ;
2. Rusu M., 1992, 1993, Agrochimie, (vol. I, II), TipoAgronomia, Cluj-Napoca ;
3. Marilena Mărghitaș, Cătălin Băluțiu, 1996, Agrochimie – Lucrări practice, TipoAgronomia, Cluj-Napoca ;
4. Marilena Mărghitaș, 2003, Agrochimie, Ed. AcademicPres, Cluj-Napoca ;
5. Rusu Mihai, Marilena Mărghitaș, Tania Mihăiescu, I. Oroian, Adelina Dumitraș, 2005, Tratat de Agrochimie, Ed. Ceres, București ;
6. Marilena Mărghitaș, M. Rusu, Tania Mihăiescu, 2005, Fertilizarea plantelor agricole și horticole, Ed. AcademicPres, Cluj-Napoca ;
7. Mihai Rusu, Marilena Mărghitaș șicolab., 2010, Cartarea agrochimică - Studiu agrochimic al solurilor - Ed. AcademicPres, Cluj-Napoca ;
8. Marilena Mărghitaș șicolab., 2011, Manual de bune practici în tehnologia fertilizării plantelor agricole, Ed. AcademicPres, Cluj-Napoca ;

Optional bibliography:

1. Hera C., Z. Borlan, 1980, Ghid pentru alcătuirea planurilor de fertilizare, Ed. Ceres, București ;
2. Borlan Z., C. Hera, 1982, Tabele și nomograme agrochimice, Ed. Ceres, București ;
3. Borlan Z. șicolab., 1994, Compendiu de Agrochimie, Ed. Ceres, București ;
4. Vellicica Davidescu, D. Davidescu, 2002, Compendiu agrochimic, Ed. Academiei, București ;
5. Marilena Mărghitaș, Mihai Rusu, 2003, Utilizarea îngrășămintelor și amendamentelor în agricultură, Ed. AcademicPres, Cluj-Napoca ;

9. Corroborating the discipline content with the expectations of the epistemic community representatives, of the professional associations and of the relevant employers in the corresponding field

In order to identify ways of modernizing and continuously improving the teaching and the content of the courses, with the most current topics and practical problems, the teacher and students participate in the annual symposium of the USAMV Cluj-Napoca, the Agriculture and Horticulture section and the annual SNRSS Conference where current issues of Agrochemistry and the management of the use of fertilizers and nutrients in Agriculture are discussed.

10. Evaluation

Type of activity	10.1. Evaluation criteria	10.2. Evaluation type	10.3. Percentage of the final grade
10.4. Course	<p>Overview, definitions, concepts about soil fertility, productivity and quality;</p> <p>Agrochemical methods for controlling and evaluating the state of soil fertility and quality;</p> <p>Content of agrochemical mapping - the agrochemical study of soils, the component phases: the preparatory phase, the field phase, the laboratory phase and the office phase and mapping;</p> <p>Possibilities for improving the content of agrochemical mapping and studies in Romania;</p> <p>Assessments related to the carrying out of soil studies and analyzes for agrochemical purposes in community countries;</p> <p>Case studies of the use of mapping - agrochemical studies: Agrochemical monitoring - an integral part of soil quality monitoring; Achieving integrated nutrient and fertility management for sustainable agriculture;</p> <p>Possibilities of deepening the phosphorus regime in soil through mapping - agrochemical studies;</p> <p>Problems of using microelements in fertilization systems; Organic soil matter - agrochemical evolution and involvement; Agrochemical study of soils and vegetation polluted with heavy metals (Pb, Cd, Cu, Zn);</p> <p>Diagnosis of negative nutrition and fertilization states;</p> <p>Special agrochemical studies on soil contamination and nitrate vegetation</p>	Continuous	70%
10.5. Seminar/Laboratory	<p>Working methodologies used in the sampling of soil and plant for the control and evaluation of fertility states and soil quality;</p> <p>Determination of the main agrochemical indices of soil that underlie the characterization of the regime of humic organic matter (humus), nitrogen, phosphorus</p>	There are 5 checks after each important chapter	30%

	<p>and potassium in the soil; Determining the specific agrochemical indices of acid and saline - alkaline soils in order to correct the doses of amendments; Qualitative study and identification of the main agrochemical resources (fertilizers and amendments) used in agriculture; Solved agrochemical problems and interpretation of agrochemical mapping work.</p>		
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10.6. Minimum performance standards

Mastering of scientific information transmitted through lectures and laboratories at an acceptable level. Obtaining a passing grade for practical laboratories and lectures is a condition of passing the exam.

- 1 Cycle of studies- choose one of the three options: Bachelor/Master/Ph.D.
- 2 according to the educational plan
- 3 Disciplinestatus (compulsoriness)- choose one of the options - DI (compulsory discipline) DO (optional discipline) DFac (facultative discipline).
- 4 One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Filled in on
04.09.2019

Course coordinator
Prof. PhD Mărghitaș Marilena

Laboratory work/seminar coordinator
Lecturer PhD Pop Tiberia Ioana

Approved by the
department on
05.09.2019

Head of the Department
Prof. PhD. Ranta Ovidiu