UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
Facultatea de Agricultură
Calea Mănăştur 3-5, 400372, Cluj-Napoca, România
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No._____of _____ **USAMV form 0107020111 (discipline code)**

SUBJECT OUTLINE

1. Information on the programme

1.1.Higher education institution	**University of Agricultural Sciences and Veterinary Medicine ofCluj-Napoca**
1.2. Faculty	**Agriculture**
1.3. Department	Environmental and Plant Protection
1.4. Field of study	Agronomy
1.5. Cycle of study[1]	Bachelor
1.6. Specialization/ Study programme	Environmental Engineering / 4 years
1.7. Form of education	Full-time

2. Information on the discipline

2.1.Discipline name	**FERTILIZERS AND PESTICIDES**							
2.2.Course coordinator				Prof. PhD Mărghitaş Marilena				
2.3.Seminar/ laboratory/ project coordinator				Assistent PhD Toader Constantin				
2.4. Year of study	II	2.5. Semester	II	2.6. Evaluation type	Summative (E)	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 onbooks, textbooks, bibliographyand 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, portfoliosand essays					15
3.4.4.Tutorials					4
3.4.5.Examinations					10
3.4.6. Other activities					
3.7. Total hours of individual study	64				
3.8. Total hours per semester	120				
3.9. Number of credits[4]	4				

4. Prerequisites(if applicable)

4.1. curriculum-related	Mathematics, Chemistry, Pedology, Botany, Biochemistry, Biophysics and Agrometeorology, Plant Physiology, Agrotechnology and Experimental Technique, Zootechnics
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.
5.2.for the	During the practical laboratory work,E the presence of the specialized teacher in the

seminar/ laboratory/ project	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.

6. Cumulated specific competences

Professional competences	To know the agronomic and agrochemical language specific to the understanding of Agrochemistry; To know the characteristics and the functioning of the bioproductivity of ecosystems; To understand the theoretical principles and practical measures underlying the knowledge of agrochemical resources and the management of their use in agriculture and horticulture, under the conditions of agrochemical optimization of the soil-plant system and obtaining higher agricultural and horticultural products quantitatively and qualitatively, as well as their profitability; To acquire knowledge regarding the use of natural organic resources, land management and fertilization of agricultural and horticultural systems, good agricultural practices, respect for nature and biodiversity (ecological management, management of animal husbandry and maintenance) according to the proposed EU strategy for rural and urban space development; To understand the impact of anthropic activities on the environment and remedial measures to be taken;To be able to implement the measures of the development of the green spaces in the urban areas, the mountain areas, the strengthening of the specific management of the rural areas, the development of the villages and their evolution towards the modern civilization.
Transversal competences	To demonstrate the ability 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; 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; 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; To be able to determine the economic efficiency of the soil-plant-fertilizer system at different agricultural crops; 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.

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

7.1. General objective	To acquire the knowledge regarding the role of nutrients in plants life and the need of plants for nutrients. To acquire the efficiency and optimization of fertilization systems for the main plant species. To obtain higher agricultural and horticultural productions quantitatively and qualitatively with maintaining and increasing soil fertility and implicitly the real protection of agro-ecosystems for sustainable agriculture and a clean and healthy environment.
7.2. Specific objectives	To know the chemical composition of the plant and the specific and global nutrient consumption of each plant in order to correctly determine the optimal economic doses of fertilizers in agro-ecosystems and ecosystems; To know the main agrochemical indices of soils that underlie the calculation of optimum economic doses of fertilizers for plants and the landscapes for obtaining quality crops and organizing the green spaces with diversified species; To know the main characteristics of the natural organic and mineral agrochemical resources used in agricultural and horticultural works; To acquire practical and decisional skills in the field.

8. Content

8.1. COURSE **Number ofhours –28**	Teaching methods	Observation
Chapter 1. Fertilizers (fertilizers) - means of quantitative and qualitative increase of plant production and soil fertility. 1.1. Definition of fertilizers (fertilizers) and their classification; 1.2. Physical and chemical indicators for characterizing the quality of fertilizers (fertilizers); 1.3. Chemical (mineral) fertilizers with primary macro-elements (N, P, K): 1.3.1. Simple nitrogen fertilizers: Nitrogen in soil - plant; Classification and assortment of nitrogen fertilizers (ammoniacal, nitric, nitric and	Lecture	10 lectures = 20 hours

ammoniacal, amidic, slowly soluble amidic, nitrogenous liquids); Conditions for the efficiency of nitrogen fertilizers. 1.3.2. Simple fertilizers with phosphorus: Phosphorus in soil - plant; Classification and assortment of phosphorus fertilizers (soluble in water, in conventional reagents and in strong acids); Conditions for the efficiency of phosphorus fertilizers. 1.3.3. Simple fertilizers with potassium: Potassium in soil - plant; Classification and assortment of potassium fertilizers (raw potassium salts, soluble potassium salts, other potassium resources); Conditions of efficiency of potassium fertilizers; 1.4. Chemical (mineral) fertilizers with secondary macro-elements (S, Ca, Mg): 1.4.1. Simple sulfur fertilizers: Sulfur in soil - plant; Classification and assortment of sulfur fertilizer resources (amendments, mineral fertilizers with other elements, other resources); Conditions for the efficient application of sulfur fertilizers. 1.4.2. Fertilizers and other resources with calcium: Calcium in soil - plant; Classification of calcium fertilizer resources (amendments for acidic soils, amendments for alkaline soils, fertilizers with other elements); Conditions for the efficiency of calcium fertilizer resources. 1.4.3. Fertilizers with magnesium: Magnesium in soil - plant; Classification of magnesium fertilizing resources (mineral salts and natural rocks); Conditions of efficiency of magnesium fertilizer resources. 1.5. Fertilizers with microelements (Fe, Mn, Cu, Zn, B, Mo): 1.5.1. Iron fertilizers: Iron in soil - plant; Chloride power indices; Classification of iron fertilizers (mineral salts and iron chelates); The efficient conditions of iron fertilizers. 1.5.2. Manganese fertilizers: Manganese in soil - plant; Classification of manganese fertilizers (mineral salts and manganese chelates); The efficient conditions of manganese fertilizers. 1.5.3. Copper fertilizers: Copper in soil - plant; Classification of copper fertilizers (mineral salts and copper chelates); Conditions for the efficient application of copper fertilizers. 1.5.4. Zinc fertilizers: Zinc in soil - plant; Zinc fertilizers (mineral salts and zinc chelates); The effective conditions of zinc fertilizers. 1.5.5. Fertilizers with boron: Boron in soil - plant; Boron fertilizers (boron mineral compounds); Conditions for efficient application of boron fertilizers. 1.5.6. Fertilizers with molybdenum: Molybdenum in soil - plant; Fertilizers with molybdenum (mineral salts); Conditions for efficient application of molybdenum fertilizers. 5.6. 1.6. Complex and mixed (compound) mineral fertilizers with 2-3 and more fertilizing elements. Classification, trends and the role of fertilization with compound fertilizers in agricultural and horticultural technologies, perspectives: 1.6.1. Solid complex fertilizers (binary and ternary); 1.6.2. Complex liquid fertilizers (soil, crystalline and foliar solutions); 1.6.3. Mixed fertilizers; 1.6.4. Ionic fertilizers (organo - minerals); 1.7. Natural organic fertilizers: Classification, advantages of use; Organic fertilizer assortments (manure, semi-liquid manure, poultry manure, sewage sludge - settling, vegetable and household residues, peat, compost, green manure); Conditions for the efficient application of organic fertilizers. 1.8. Fertilizer storage, handling and application: Fertilizer storage; Methods of application of fertilizers.	Lecture	1 lecture = 2 hours
Chapter 2. Fertilizers and crop quality 2.1. The effect of macro- and microelements on crop quality; 2.2. Principles related to quality indicators and safety - food security.	Lecture	3 lectures=6 hours
Chapter 3. Pesticides and protection of agro-ecosystems 3.1. General; 3.2. Pesticide classification; 3.3. How to apply pesticides; 3.4. General aspects regarding the pollution of the environment; 3.4.1. The main types of pollution.		

			grade
10.4.Course	Chemical (mineral) fertilizers with secondary macroelements (S, Ca, Mg); Fertilizers with microelements (Fe, Mn, Cu, Zn, B, Mo); Complex and mixed (compound) mineral fertilizers with 2-3 and more fertilizing elements. Classification, trends and the role of fertilization with compound fertilizers in agricultural and horticultural technologies, perspectives; Natural organic fertilizers: Classification, advantages of use; Organic fertilizer types; Fertilizer storage, handling and application: Fertilizer storage; Methods of fertilizer application; Establishing fertilizer doses and harvest quality; Agrochemical methods of soil fertility control; Principles and methods of rational use of fertilizers in the main agricultural and horticultural crops; Protection of agroecosystems in the context of the use of fertilizers and amendments.	summative(E)	70%
10.5. Seminar/Laboratory	Working methodologies used in the sampling of fertilizers for the qualitative and quantitative analysis; Classical methods of fertilizer identification through preliminary analysis (indicative analysis, coal burning and flame burning); Qualitative study and identification of fertilizers with nitrogen, phosphorus, potassium, of complex and mixed fertilizers and natural organic used in agricultural practice; Qualitative study of the main fertilizers with nitrogen, phosphorus and potassium used in agriculture by determining their active substance content and determining the doses of s.b./ha (commercial substance/ha); Qualitative study of calcareous amendments used in agriculture by determining the $CaCO_3$ content and establishing the neutralization power of the amendment (NAP); Recognition of the main pesticides used for chemical protection in agriculture. Solved agrochemical problems and interpretation of agrochemical mapping.	A brief check is given at the beginning of each laboratory and the final grade by practical exam at the end of the semester	30%
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
Assistant Phd Toader Constantin

Approved by the department on 05.09.2019

Head of the Department
Prof. PhD. Oroian Ioan