



NO. _____ of _____

Form code USAMV 0107010223

SUBJECT SHEET

1. Information of the program

1.1. High education institution	University of Agricultural Science and Veterinary Medicine of Cluj-Napoca
1.2. Faculty	Agriculture
1.3. Department	Environmental and plant protection
1.4. Field of study	Environmental Engineering
1.5. Cycle of study	Bachelor
1.6. Specialization/ Study program	Environmental Engineering
1.7. Form of education	IF

2. Information of the discipline

2.1. Name of the discipline	LINEAR ALGEBRA							
2.2. Holder of titular course	Profesor Phd. Ioana POP							
2.3. Holder of seminar / laboratory / project activities	Profesor Phd. Ioana POP							
2.4. Year of study	I	2.5. Semester	II	2.6. Evaluation Type	Continue	2.7. Status of discipline	Content	F
							Obligativity	DO

3. Estimative Time (teaching hours per semester)

3.1. Numbers of hours peer week-freccenty form	2	Out of: 3.2. cours	1	3.3. seminar/ laboratory/ projects	1
3.4. Total hours of educational plan	28	Out of: 3.5. cours	14	3.6. seminar/laboratory	14
Distribution of the time fund					orc
3.4.1. Study after manual, course support, bibliography and notes					30
3.4.2. Additional documentation in the library, on specialized electronic platforms and in the field					16
3.4.3. Preparation of seminars / laboratories / projects, topics, reports, portfolios and essays					10
3.4.4. Tutorial					10
3.4.5. Exams					10
3.4.6. Other activitis					10
3.7. Total hours of individual study	62				
3.8. Total semester hours	90				
3.9. Number of credits	3				

4. Preconditions (where is aplicable)

4.1. of curriculum	-
4.2. of competence	team communication skills, organization, use of the internet as a resource.

5. Condition (where is aplicable)

5.1. the course	Room equipped with computer, video projector and blackboard. Academic discipline is required for the entire duration of the lecture. No other activities are tolerated during the lecture, mobile phones must be switched off.
5.2. for conducting the seminar / laboratory / project	Room equipped with computer, video projector, blackboard. Academic discipline is required for the entire duration of the work.

6. Specific skills acquired

Professional skills	<p>1. Knowledge, understanding, explanation and interpretation. Operation with mathematical notions and methods. Mathematical processing of data, analysis and interpretation of phenomena and processes. Developing and analyzing algorithms for problem solving.</p> <p>2. Instrumental-applicative - explanation, debate, case study, problematization, simulation of situations, group and individual working methods, methods of thinking development and bibliography study. Design of mathematical models for the description of phenomena, based on the previous study.</p> <p>3. Attitudinal - the manifestation of analytical and responsible attitudes towards the mathematical field that helps to investigate economic or engineering problems in the environmental field.</p>
Transversale skills	<p>The application of the rules of rigorous and efficient work, the manifestation of responsible attitudes towards the scientific and didactic field, for the optimal and creative exploitation of its potential in specific situations, respecting the principles and norms of professional ethics.</p> <p>Effective and effective conduct of team activities.</p> <p>Efficient use of information sources and resources for communication and assisted vocational training.</p>

7. The objectives of the discipline (based on the grid of specific skills acquired)

7.1. General Objectiv	Knowledge and understanding of the important basics of linear algebra, together with the development of the skills to correctly apply the knowledge accumulated to solve the different types of problems and the ability to think and analyze for problems of linear algebra.
7.2. General Objective	<p>Acquire knowledge to understand the concepts of: linear space, linear dependence, base and size, linear, bilinear and quadratic forms.</p> <p>The correct application of the basic methods and principles in solving linear algebra problems.</p> <p>The ability to recognize the main classes / types of linear algebra problems and select the appropriate methods and techniques for solving them.</p> <p>The ability to carry out projects for mathematical modeling of a concrete problem.</p> <p>Ability to apply the techniques and methods presented at the course and at the seminar.</p>

8. Contents

8.1.Cours Numbers of Hours – 14	Teacheing methodes	Obs
1 Linear spaces. Definition, properties, calculation rules in linear spaces, observations on linear spaces.	Lecture	1 hour
2. Remarkable linear spaces (canonical, arithmetic, complex numbers, quaternions, matrices, polynomials). The complex of a real linear space.	Lecture	1 hour
3. Linear dependence. The linear combination. System of dependent linear vectors. Independent linear vector system	Lecture	1 hour
4. Base. Dimension. Generating vector system. The basis of a linear space. The size of a linear space. Base and coordinate changes	Lecture	1 hour
5. Linear subspaces. Definition and properties	Lecture	1 hour
6. Linear space of free vectors. Vector operations. Related vectors. Free vectors. The free space linear space. Linear dependence of free vectors. Coordinates of free vectors in a base	Lecture	1 hour
7. Vector products. The scalar, vector and mixed product of free vectors. Double vector product	Lecture	1 hour
8. Linear applications between linear spaces. Definition. The core and image of a linear application. The matrix expression of a linear application	Lecture	1 hour
9. Linear shapes. Biliary forms. definition. The analytical and matrix expression of a linear form. Dual linear space. Definition of bilinear forms. Matrix expression of a bilinear form	Lecture	1 hour

10. Tensors. Definition. The analytical and matrix expression of a tensor. Tensile covariant, contravariant and small	Lecture	1 hour
11. Square shapes. Definition. The analytical and matrix expression of a quadratic form. Bringing the quadratic forms to the canonical form	Lecture	1 hour
12. Scalar product. Euclidean spaces. Definition of the scalar product. Remarkable Euclidean spaces	Lecture	1 hour
13. Standard. Normalized linear spaces. Definition of the norm. Remarkable standard spaces	Lecture	1 hour
14. Orthonormation procedures. The connection between Euclidean spaces and orthonormal spaces. Orthonormation procedures	Lecture	1 hour

8.2. Practical work Number of hours – 14	Theaching Methodes	
1. Work instructions and norms of labor safety technique in the profile laboratories.		1 hour
2. Examples of linear spaces	Application of notions	1 hour
3. System of dependent or independent linear vectors	theoretical databases	1 hour
4. Basis of a linear space. The coordinates of a vector in a base Base and coordinate changes	delivered	1 hour
5. Free vector operations. Vector products	Exercises, applications,	1 hour
6. Examples of linear applications between linear spaces	discussions and debates.	1 hour
7. Examples of linear shapes.		1 hour
8. Example of bilinear form		1 hour
9. Covariance, contravariant and mixed tensors		1 hour
10. To bring the quadratic forms to the canonical form		1 hour
11. Examples of scalar products		1 hour
12. Example of rules		1 hour
13. Orthonormation procedures	Testing	1 hour
14. Verification of knowledge		1 hour

Bibliography Required:

1. Pop Ioana. *Linear algebra. Course notes. 2014.*
2. Mot, G., Popa, L. *Linear algebra. Troubleshooting, Mirton Ed., Timisoara, 1999.*
3. Mff, G., et al. *Exercises and mathematics problems for students of technical and economic profiles, Ed Arădeana, 2003.*
4. Roșculeț, M. *Linear algebra, analytical geometry and differential geometry, Technical Ed. 1987.*

Optional bibliography:

1. Antohe St., N. Codau, *Linear algebra and analytical geometry, Galati. 1979.*
2. Mot, G., Petrusel, A. *Higher mathematics for engineers and economists, Mirton Ed., Timisoara, 1999.*
3. Mot, G., Popa, L. *Higher algebra for technical and economic profiles. Theory and applications. Ed. Univ. "Aurel Vlaicu" Arad, 2010.*

9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic communities, professional associations and representative employers in the field related to the program

The content of the discipline is in accordance with what is studied in the field of linear algebra in other university centers in the country and abroad.
The content and structure of the course are aspects adapted to the needs of the students and the requirements of the years of higher studies.

10. Evaluation

Type of activity	10.1. Evaluation criteria	10.2. Evaluation Methods	10.3. Weight in the final grade
10.4. Cours	It follows the logic, the global view that the student has on the subject, the way of exposure and	Sumativs	70%

	explanation and synthesis ability of the answer.		
10.5. Seminar/Laboratory	The correctness of the answers to the questions. Solving exercises.	Questions and exercises	30%
10.6. Minim standard of performances			
Course: obtaining the qualification admitted to the practical works. Approaching the exam subjects at least 50%.			
Practical works: obtaining the qualification admitted by solving the exercises required and of the theoretical subjects in proportion of at least 50%.			

1 The cycle of studies - one of the variants is chosen - Bachelor / Master / Doctorate

2 The regime of the discipline (content) - for the license level one of the variants is chosen - DF (fundamental discipline), DD (discipline in the field), DS (specialized discipline), DC (complementary discipline).

3 The regime of the discipline (compulsory) - one of the variants is chosen - DI (compulsory discipline) DO (optional discipline) DFac (optional discipline).

4 A credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Completion date
04.09.2019

Course Holder
Profesor Phd. Ioana POP

Holder of laboratory /seminars
Profesor Phd. Ioana POP

Date of approval in department
05.09.2019

Department Director
Profesor Phd. Ioan OROIAN