

# Mathematics (Specialization Agricultural Biotechnologies 1st YEAR, 1st SEMESTER)

Credit value (ECTS) 5

## Course category

Domain (Imposed)

## Course holder:

Lecturer. Ciprian CHIRUȚĂ PhD

## Discipline objectives (course and practical works)

Becoming familiar with the main types of issues and approaches in mathematics and applying mathematical concepts in economics and agriculture.

Mathematical modeling of practical problems commonly used in biological and agricultural research and learning the laws of techniques.

Acquiring skills for the use of rigorous reasoning and individual study skills;

Forming a systemic point of view on the field and apparatus of Mathematics.

Acquiring the computation skills necessary for the mastering of the mathematical reasoning in using statistic tests;

Applying the given theoretical concepts in order to solve specific problems and modeling processes.

Understand the limits, continuity, differentiability, integrability of real functions of a real variable using appropriate practical examples;

Application of theoretical notions being exposed to solve specific problems.

Knowledge of analytical research methods in the field and their application in the profile disciplines. Learning models to calculate the derivative, primitives and the integral of a function of several variables.

## Contents (syllabus)

Course (chapters/subchapters)
<b>Elements of abstract algebra</b>
Vector spaces, linear dependence and independence, generators' system, base of a space vector, change of coordinates of a vector when moving from one basis to another, substitution lemma, substitution lemma applications.
Linear transformations, matrix associated to a linear transformations, nucleus and image of a linear transformation, eigenvalues and eigenvectors.
<b>Elements of linear programming</b>
Examples leading to linear programming problems. Graphical method for solving linear programming problems.
The simplex method for solving linear programming problems.
Descrierea algoritmului simplex; Metoda celor două faze Description of the simplex algorithm; The two-phased method
<b>Functions of a real variable</b>
Limit and continuity of real functions of a real variable. Continuous functions, limits and continuity, properties of continuous functions on an interval. Points of discontinuity and their classification. Monotone functions.

<b>Differential calculus</b>
Derivatives and differentials of real functions of a real variable. Operations of differentiable functions. Differentiable function composed and inverse functions. Fundamental theorems of differential calculus (Fermat's theorem, Rolle's theorem, theorems average) and their consequences
Rating points optimally using derivatives. Applications of differential and integral calculus in biology.
<b>Functions of several variables</b>
Function of several variables. Limit and continuity for functions of several variables. Derivatives and differentials of functions of several variables. Extremes of functions of several variables.
<b>Integral calculus</b>
Primitive and integral undefined. Methods of integration: integration by parts formula and formula variable change.
Riemann integrals functions. Properties of integrals functions. Leibniz Newton's formula. The formula of integration by parts and change of variable formula. Improper integrals.

<b>Practical works</b>
Matrices and determinants, matrix operations.
Systems of linear equations, the Gauss method, the Gauss Jordan method, the inverse of a matrix.
Independent linear system, dependent linear system, generators' system, basis, change of vector coordinates in the transition from one basis to another.
Linear transformations, matrix associated to a linear transformations, nucleus and image of a linear transformation, eigenvalues and eigenvectors.
Solving linear programming problems by the graphical method
Using the primal simplex algorithm to determine the optimal solution of a linear programming problem,
Solving linear programming problems by the method of two phases. Transportation problems.
Strings remarkable limits strings
Limits of functions, derivative of a function, asymptotes and extreme points.
Graphical representation of functions.
Functions of two variables, partial derivatives.
Local extreme points, gradient, rotor.
Integration methods
Applications of integrals, length, area, volume. Improper integrals

## Bibliography

1. Anca Precupanu, „Bazele Analizei matematice”, Ed. Polirom, editia a III-a, revazuta si adaugita, 1999.
2. Aldea Florica, *Matematici aplicate în științele agricole și silvice*, Editura Risoprint, Cluj Napoca, 2006.
3. Bunu I. coord. colectiv de autori, *Matematici economice*, Departamentul Editorial Poligrafic al Academiei de Studii Economice a Moldovei, Chișinău, 2012.
4. Burdujan I., *Elemente de algebră cu aplicații în biologie*, Ed. Pim, Iași, 2006.

5. Chiruță C., *Elemente de matematică: programare liniară, statistică matematică*, Editura „Ion Ionescu de la Brad” Iasi, 2019.
6. Diaconița V., Spînu M., Rusu Ghe., *Matematici aplicate în economie*, Ed. Sedcom Libris, Iași, 2004.
7. Aldea Florica, *Matematici aplicate în științele agricole și silvice*, Editura Risoprint, Cluj Napoca, 2006.
8. Bunu I. coord. colectiv de autori, *Matematici economice*, Departamentul Editorial Poligrafic al Academiei de Studii Economice a Moldovei, Chișinău, 2012.
9. Burdujan I., *Elemente de algebră cu aplicații în biologie*, Ed. Pim, Iași, 2006.

### Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Oral and written examination	10%+60%
Appreciation of the activity during the semester	Oral assessment during the semester and written verification test.	30%

### Contact

**Lecturer. Ciprian CHIRUȚĂ PhD**

Facultatea de Horticulture - USAMV Iași

Aleea Mihail Sadoveanu nr. 3, Iași, 700490, România

telefon: 0040 232 407 437,

E-mail: [kyru@uaiasi.ro](mailto:kyru@uaiasi.ro)