

## Mathematics and statistics (Ist YEAR, IInd SEMESTER)

Credit value (ECTS) 5

Course category: Mandatory

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 probabilities and optimization 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;

Understanding the probability theory and linear programming notions using appropriate practical examples;

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

Knowledge of statistical research methods in the field and their application in the profile disciplines.

Acquiring mathematical programming (linear) models.

### 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.
Description of the simplex algorithm; The two-phased method
<b>Probability theory elements</b>
Events. Operations with events. Probabilities. Conditional probabilities. Formulas for calculating probabilities.
Classical probability schemes, discrete and continuous random variables. Operations with random variables. The distribution function of a random variable. Typical values of a random variable. Covariance.
Discrete distributions. Continuous distributions.
<b>Elements of statistics</b>

Organization and describing data. Grouping and graphic representations of the statistical series, Numerical characteristics of statistical series, absolute frequency, relative frequency, cumulative frequencies. Regression, correlation method.
Estimation theory. Estimates point. Estimates by confidence intervals.
Statistical tests.

Practical works
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.
Events, operations, probabilities, conditional probabilities, total probability formula, Bayes' formula.
Classical probability schemes (Bernoulli, Poisson, Hypergeometric, generalized)
Random variables. The distribution function of a random variable. Numerical characteristics of random variables: mean, median, modal value, quintiles, simple and centered time, amplitude, dispersion, standard deviation, Pearson coefficient of variation, Fisher asymmetry coefficient, kurtosis and flattening.
Graphical representation of statistical series, absolute frequencies, relative (cumulative)
Regression, correlation method.
Confidence intervals, Student test.

### Bibliography

1. Aldea Florica, *Matematici aplicate în științele agricole și silvice*, Editura Risoprint, Cluj Napoca, 2006.
2. Bunu I. coord. colectiv de autori, *Matematici economice*, Departamentul Editorial Poligrafic al Academiei de Studii Economice a Moldovei, Chișinău, 2012.
3. Burdujan I., *Elemente de algebră cu aplicații în biologie*, Ed. Pim, Iași, 2006.
4. Diaconița V., Spînu M., Rusu Ghe., *Matematici aplicate în economie*, Ed. Sedcom Libris, Iași, 2004.
5. Jaba Elisabeta, *Statistică* - ediția a doua - Editura Economică, București, 2000.
6. Jaba Elisabeta, *Statistică descriptivă - manual pentru învățământ deschis la distanță*, Ed. Univ. Al. I. Cuza, Iași, 2005.
7. Jaba Elisabeta, Pintilescu Carmen, *Statistică - teste grilă și probleme*, ediția a doua, Ed. SedcomLibris, Iași, 2007.
8. Diaconița V., Spînu M., Rusu Ghe., *Matematici aplicate în economie - Teste grilă*, Ed. Sedcom Libris, Iași, 2004.
11. Burtea M., Burtea Georgeta, *Matematică, clasa a X-a*, Ed. Carminis, Pitești, 2005.
12. **Chiruță C.**, *Elemente de matematică. Programare liniară și statistică matematică*, Editura „Ion Ionescu de la Brad” Iasi, 2019.

## 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.	10% + 20%

## Contact

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