MATHEMATICAL ANALYSIS (Ist Year of study, Ist Semester)

Credit value (ECTS) 5

Course category
Domain (Imposed)

Course holder:
Lect. PhD. Emilian BULGARIU

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 probabilityes and optimization techniques.
- Acquiering skills for the use of rigorous reasoning and individual study skills;
- Forming a systemic point of view on the fiel and apparatus of Mathematics.
- Acquiering 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)
Functions of a real variable
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.
Differential calculus
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
Characterization using derivative monotony. L'Hospital's rule. Higher order derivability. Convexity characterization using second order derivative sign.
Taylor's formula. Rating points optimally using derivatives. Applications of differential and integral calculus in biology.
Functions of several variables
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
Number series. Series of functions

Number series. Series with positive terms. Criteria for convergence of series with positive terms. Sequences and series of functions. Power series. Development of functions in power series.
Integral calculus
Primitive and integral undefined. Methods of integration: integration by parts formula and formula variable change. Riemann integrability of a function and Riemann integral
Riemann integrals functions. Properties of integrals functions. Leibniz Newton's formula. The formula of integration by parts and change of variable formula. Improper integrals
Differential equations
First order differential equations. Differential equations with variables separable. First order differential equations homogeneous. First order linear differential equations.

Practicum
The derivative of a function of a real variable (review), applications of derivatives.
The derivative of order n, the string of Rolle, the evolution of a function, differentiability and extreme points for functions of a real variable
Derivative-order, second order, mixed derivative of a function of two real variables.
Order differential I and II order for functions of two real variables.
Local extreme points for functions of two real variables, gradient, rotor.
Series of numbers, criteria of convergence of series with positive terms.
Series of numbers, convergence criteria series with some terms.
Series of functions. Decomposition Taylor series, Maclaurin's formula.
Interpolation methods. Lagrange polynomial interpolation, Newton. The method of least squares
Integrale. Calculation methods.
Definite integrals, Applications of integrals, length, area, volume.
Differential equations with variables separable
Homogeneous first order differential equations

References

1. **Burdujan I**.-*Elemente de matematici cu aplicaţii în Biologie,* Ed.Vasiliana'98, Iaşi 2001.
2. **Ciucu G., Craiu V.** - *Teoria estimaţiei şi verificarea ipotezelor statistice,* EDP, Bucureşti, 1971.
3. **Craiu V.** - *Verificarea ipotezelor statistice,* EDP Bucureşti, 1972.
4. **Stoleriu I.,** - *Statistică prin Matlab,* Ed. Matrixrom, Bucureşti, 2010.
5. **Chiruţă C.,** *Elemente de matematică - Programare liniară şi statistică matematică*, Ed. Ion Ionescu de la Brad, iaşi, 2019
6. **BULGARIU E.,** *Indrumar pentru seminariile de Analiza Matematica*, Ed. Ion Ionescu de la Brad, Iaşi, 2018

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Course	Exam	70%
	presence	10%
Practical works	Tests + course and practical	20%

Contact
Lect. PhD. Emilian BULGARIU
Faculty of Horticulture - USAMV Iaşi
Aleea Mihail Sadoveanu nr. 3, Iaşi, 700490, Romania
Tel: 0040232407466,
E-mail: ebulgariu@uaiasi.ro