SYLLABUS
Applied Mathematics for Economics
Academic year 2025-2026

1. Information regarding the program

1.1. Higher education institution	Universitatea Babeş Bolyai
1.2. Faculty	Business
1.3. Department	Business
1.4. Field of study	Business Administration
1.5. Study cycle	Bachelor
1.6. Study programme/Qualification	Business Administration/Bachelor in Economic Studies
1.7. Form of education	Full time

2. Information regarding the discipline

2.1. Name of the discipline	Applied Mathematics for Economics					Discipline code	ILE0086
2.2. Course coordinator	Assoc.prof. Gabriela PETRUŞEL, PhD						
2.3. Seminar coordinator	Assoc.prof. Gabriela PETRUŞEL, PhD						
2.4. Year of study	1	2.5. Semester	2	2.6. Type of evaluation	E	2.7. Discipline regime	compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1. Hours per week	4	of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4. Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment for individual study (ID) and self-study activities (SA)					**hours**
Learning using manual, course support, bibliography, course notes (SA)					14
Additional documentation (in libraries, on electronic platforms, field documentation)					14
Preparation for seminars/labs, homework, papers, portfolios and essays					28
Tutorship					2
Evaluations					2
Other activities:					9
3.7. Total individual study hours					**69**
3.8. Total hours per semester					**125**
3.9. Number of ECTS credits					**5**

4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	

5. Conditions (if necessary)

5.1. for the course	classroom with computer and projector;
5.2. for the seminar /lab activities	classroom with computer and projector;

6.1. Specific competencies acquired

Professional/essential competencies	C1. Gathering, processing, and analysing data regarding the interaction between a company/ an organisation and the external environment. C1.3. Assessing critically and constructively the way of explaining and/or solving problems referring to the economic influence of the external environment on a company/an organization. C2. Providing assistance for running a company/ an organisation as a whole. C2.3. Applying the appropriate tools for solving a problem regarding the relations between the subdivisions of the enterprise/organization..
Transversal competencies	CT.1. Implementing ethical principles, norms, and values within one's own rigorous, efficient, and responsible strategy of work.

6.2. Learning outcomes

Knowledge	The student has knowledge of accounting, processing, and analysis of economic and financial information required for an effective organisation and management of businesses. • Know mathematical methods and use computational technologies to perform analyses and design solutions to specific problems. Know methods of collecting data and making statistics for testing and evaluation in order to generate statements and pattern predictions, in order to discover useful information in the decision-making process.
Skills	The student has the necessary skills to use methods and techniques specific to the financial and accounting management of an enterprise as a whole, specialised software included. • Use dedicated software for data analysis, including statistics, spreadsheets and databases, explore the possibilities to prepare reports to administrators, superiors or customers. • Performs systems analysis and calculates to what extent changes could affect the results
Responsibility and autonomy:	

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• acquire knowledge and skills in several areas of mathematics, economics and business critical applications; • developing skills of mathematical modelling of business processes; • communication skills in mathematical language;
7.2 Specific objective of the discipline	• the ability to use the mathematical language in understanding economic phenomena; • the ability to interpret phenomena and economic trends through the mathematical apparatus; • the ability to determine the optimal in an economic process; • the ability to effectively use post-optimization techniques and parametric programming of economic process that can be transcribed into linear programming language; • the ability to produce an optimal transport plan;

8. Content

8.1 Course	Teaching methods	Remarks
1. Real functions of one variables ✓ the notion of function of one variable, the table of variation, the graph; ✓ the properties of real functions of one variable;	interactive discussion,	one lecture
2. Extreme values for real functions of one variable with applications in business ✓ Find the extreme points of real functions of one variable; ✓ Find the maximum value of the economical functions of one variable;	interactive discussion,	one lecture
3. Differential calculus ✓ differential of a real function of several variables; ✓ partial derivatives of first order; ✓ higher order partial derivatives; ✓ higher order differentials;	interactive discussion,	one lecture
4. Extreme values for real functions of several variables ✓ Find the extreme points of real functions of several variable with applications in economics;	interactive discussion,	one lecture
5. Adjustment and interpolation of data with applications in business ✓ data adjustment; ✓ data interpolation;	interactive discussion,	one lecture
6. Real n-dimensional vector space ✓ vector space R^n ✓ linear dependence in R^n ✓ basis in a vector space; ✓ the basis algorithm with applications;	interactive discussion,	one lecture
7. Linear equations and inequality systems ✓ how to solve a linear equation system using basis changing algorithm; ✓ how to solve linear inequality system;	interactive discussion,	one lecture
8. Linear programming problem	interactive discussion,	one lecture

✓ mathematical modeling for the linear programming problem; ✓ solutions for a linear programming problem; ✓ graphical method and algebraic method;		
9. The Simplex Algorithm ✓ the rules of simplex algorithm method;	interactive discussion,	one lecture
10. Duality in linear programming problem ✓ dual problem; ✓ dual simplex algorithm;	interactive discussion,	one lecture
11. Post-Optimization ✓ the problem of post-optimization; ✓ modifying the objective functions coefficients;	interactive discussion,	one lecture
12. Parametric programming problem ✓ the problem of parametric programming; ✓ using parameters as coefficients of objective function;	interactive discussion,	one lecture
13. Transportation problems with applications in business ✓ construction of transportation problem; ✓ solutions of a transportation problem; ✓ solving methods;	interactive discussion,	one lecture
14. Revision ✓ solving a model for final exam;	interactive discussion,	one lecture

Bibliography:

1. Tania Lazăr, Vasile Lazăr, Gabriela Petruşel: Matematici aplicate în economie, Risoprint 2014, 200 p.
2. Cristian Chifu, Gabriela Petrusel, *Matematica aplicata in administrarea afacerilor,* Casa Cartii de Stiinta, 2012.
3. Chifu I.C., Matematici pentru economişti, Alma Mater, Cluj-Napoca, 2006. (biblioteca facultăţii).
4. Mureşan A. S., Mihoc M.,..., *Matematici pentru economişti*, vol. I, Ed. Dacia, Cluj-Napoca, 2000.
5. Wilkes M., *Mathematics for Business, Finance and Economics*, International Thomson Business Press, 1999.

8.2 Seminar / laboratory	Metode de predare	Observaţii
1. Real functions of one variables ✓ the notion of function of one variable, the table of variation, the graph; ✓ the properties of real functions of one variable;	exercise, case study	one seminar
2. Extreme values for real functions of one variable with applications in business ✓ Find the extreme points of real functions of one variable; ✓ Find the maximum value of the economical functions of one variable;	exercise, case study	one seminar
3. Differential calculus ✓ differential of a real function of several variables; ✓ partial derivatives of first order; ✓ higher order partial derivatives; ✓ higher order differentials;	exercise, case study	one seminar
4. Extreme values for real functions of several variables	exercise, case study	one seminar

✓ Find the extreme points of real functions of several variable with applications in economics;		
5. Adjustment and interpolation of data with applications in business ✓ data adjustment; ✓ data interpolation;	exercise, case study	one seminar
6. Real n-dimensional vector space ✓ vector space R^n ✓ linear dependence in R^n ✓ basis in a vector space; the basis algorithm with applications;	exercise, case study	one seminar
7. Linear equations and inequality systems ✓ how to solve a linear equation system using basis changing algorithm; ✓ how to solve linear inequality system;	exercise, case study	one seminar
8. Linear programming problem ✓ mathematical modeling for the linear programming problem; ✓ solutions for a linear programming problem; ✓ graphical method and algebraic method;	exercise, case study	one seminar
9. The Simplex Algorithm ✓ the rules of simplex algorithm method;	exercise, case study	one seminar
10. Duality in linear programming problem ✓ dual problem; dual simplex algorithm;	exercise, case study	one seminar
11. Post-Optimization ✓ the problem of post-optimization; ✓ modifying the objective functions coefficients;	exercise, case study	one seminar
12. Parametric programming problem ✓ the problem of parametric programming; ✓ using parameters as coefficients of objective function;	exercise, case study	one seminar
13. Transportation problems with applications in business ✓ construction of transportation problem; ✓ solutions of a transportation problem; ✓ solving methods;	exercise, case study	one seminar
14. Revision ✓ review exercises and problems	exercise, case study	one seminar

Bibliography:

1. Tania Lazăr, Vasile Lazăr, Gabriela Petruşel: Matematici aplicate în economie, Risoprint 2014, 200 p.
2. Cristian Chifu, Gabriela Petrusel, *Matematica aplicata in administrarea afacerilor,* Casa Cartii de Stiinta, 2012.
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5. Wilkes M., *Mathematics for Business, Finance and Economics*, International Thomson Business Press, 1999.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

The course content is correspondence with what is done in other universities in the country and abroad. To adapt to the market demands of the contents meetings were held with representatives of the business community.

10. Evaluation

- **The same evaluation criteria are maintained for all exams sessions. The components of the evaluation process carried out during the semester cannot be recovered/redone in the examination sessions.**
- **To be able to accumulate the points obtained during the semester, it is mandatory to obtain a minimum of 5 (five) in the final exam (written/oral).**

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	• correct logical and coherent application of the concepts learned • logical and accurate explanation and interpretation of the results;	Final Exam (during the exam session)	50%
10.5 Seminar/laborator	• the ability to apply concepts learned in practice • correct logical and coherent application of the concepts learned • economic explanation of the results	Test (during the semester)	30%
		the active participation in seminars	20%
10.6 Minimum standard of performance			
For the minimum grade (5), students must • Know the fundamental concepts and to be able to apply them. • To give an interpretation of the results..			

11. Labels ODD (Sustainable Development Goals)[1]

Not Applicable

Date:	Signature of course coordinator	Signature of seminar coordinator
28.03.2025	Assoc.prof. Gabriela PETRUŞEL, PhD	Assoc.prof. Gabriela PETRUŞEL, PhD

Date of approval: 10.04.2025

Signature of the head of department
Ioan Cristian CHIFU, PhD

[1] Keep only the labels that, according to the *Procedure for applying ODD labels in the academic process*, suit the discipline and delete the others, including the general one for *Sustainable Development* – if not applicable. If no label describes the discipline, delete them all and write „*Not applicable*.".