SYLLABUS
Academic year 2024-2025
Year of Study I / Semester I

1. Information on academic program

1.1. University	**„1 Decembrie 1918" University of Alba Iulia**
1.2. Faculty	**Faculty of Economics**
1.3. Department	**Business Administration and Marketing**
1.4. Field of Study	**Business Administration**
1.5. Cycle of Study	**Bachelor**
1.6. Academic program / Qualification/ ESCO Code	**Business Administration / 242102 Process improvement specialist, 242104 Process manager, 242110 Specialist in planning, control, and reporting of economic performance; ESCO Code 2421 - Management and Organisation Analysts**

1. **Information of Course Matter**

2.1. **Course**		**Mathematics Applied to Economics**			2.2. **Code**	**BA112**	
2.3. **Course Leader/** Seminar Tutor		Lecturer. PhD. Wainberg Dorin					
2.4. Seminar Tutor		Lecturer. PhD. Wainberg Dorin					
2.5. Academic Year	**I**	2.6. Semester	**I**	2.7. Type of Evaluation (E – final exam/C- examination /VP)	**E**	2.8. Type of course (**C**– Compulsory, **Op** – optional, **F -** Facultative)	**C**

3. Course Structure (Weekly number of hours)

3.1. Weekly number of hours	**4**	3.2. course	***2***	3.3. seminar, laboratory	***2***
3.4. Total number of hours in the curriculum	**56**	3.5. course	***28***	3.6. seminar, laboratory	***28***
Allocation of time:					Hours
a Individual study of readers					***32***
b Documentation (library)					***20***
c Home assignments, Essays, Portfolios					***32***
d Tutorials					**-**
e Assessment (examinations)					***2***
f Other academic activities (study visits, mentoring, projects)					***8***

3.7 Total number of hours for individual study (a+b+c)	**84**
3.8 Total number of hours for academic activities (d+e+f+3.4)	**66**
3.9 Total number of hours per semester (3.7+3.8)	**150**
3.10 Number of ECTS	**6**

4. Prerequisites (*where applicable*)

4.1. curriculum-based	
4.2. competence-based	

5. Requisites (*where applicable*)

5.1. course-related	- classroom endowed with video projector / board
5.2. seminar/laboratory-based	- classroom endowed with video projector / board

6. Specific competences to be aquired (chosen by the course leader from the programme general competences grid)

Competences/Study results	R5/C5 Performs data analysis R11/C11 Analyzes business plans R17/C17 Manages business requirements
Transversal competences	R22/CT22 Think analytically

7. Course objectives (arising from the acquired specific competencies)

7.1 General objectives of the course	On the one hand, the aim of the discipline is to provide students with the capacity to anayse and decide in a logical and rigorous mode, and on the other hand, to contribute to the future economists'multidisciplinary trainig. This is the reason why the course content aims to the students' familiarization with the concepts and mathematical modelling technique applied to the economic phenomena, the business plan placement in mathematical context and its solving with mathematical programming methods, the formulation of mathematical models for deferred payments and credits, as well as loan reimbursement, and the optimization of certain financial operations
7.2 Specific objectives of the course	• To characterise the concept of mathematical model for an economic process; • To distinguish between various types of models (physical, abstract, deterministic, stochastic, linear, non-linear models, etc); • To know the main stages in drawing up of a mathematical model (the analysis of economic problem, formalization of the realtions between the elements of a problem, model building, model solving, i.e. solution establishment, analysis, interpretation, validation and implementation); • To determine the algoritm for dual problem elaboration; • To identify the method (methods) for solving PPLs (simplex method, transport method,...); • To distinguish between algorithms for PPL solving; • To describe the algorithms for PPL solving in post-optimization situations (free term changes in restrictions – changes in the quantity of the available resources, changes in the coefficients of the objective function – price and unitary profit changes, modification of the technological coefficients, etc.); • To characterise the algorithm for PPL solving in whole numbers; • To determine the special cases of the transport problems • To recognize and use mathematical models associated with the following types of operations: - simple and compound interest; valorification and updating; simple interest paid in advance; - loan amortization; annuities.

8. Course contents

8.1 Course (learning units)	**Teaching methods**	**Remarks**
Solving linear programming problems Algebraic and geometrical method	Lecture, discussions	*2 hours*
Simplex algorithm Particular cases: the infinite case, the degenerate case, multiple solution case	Lecture, discussions	*2 hours*
Duality. Dual simplex Couple of dual problems - symmetrical form	Lecture, discussions	*2 hours*
Re-optimization of linear programming problems Changes in vector c, column vector from matrix A, free term vectors	Lecture, discussions	*2 hours*
Parametric linear programming Linear dependency of a vector C parameter, and free term vector	Lecture, discussions	*2 hours*

Transport problems Particular cases: degenerate solution, multiple solution case	Lecture, discussions	*2 hours*
Transport problem re-optimization Modification of: the coefficient matrix, what is available and/or what is needed	Lecture, discussions	*2 hours*
Parametric transport problems. Linear vector dependency: of the coefficient matrix, what is available and/or what is needed	Lecture, discussions	*2 hours*
Special transport problems Problems with: imposed solution, restricted routes, grouped offer or demand	Lecture, discussions	*2 hours*
Simple interest Unitary interest, fructification, updating factor, medium values	Lecture, discussions	*2 hours*
Compound interest Gobal fructification/updating factor, initial/final sum	Lecture, discussions	*2 hours*
Annual deferred payment (annuities) Anticipated or posticipated payment	Lecture, discussions	*2 hours*
Credit and loan reimbursement Equivalent loan systems	Lecture, discussions	*2 hours*
Direct and indirect amortizations	Lecture, discussions	*2 hours*

Bibliography

1. P. Blaga , A. Mureşan - *Matematici aplicate în economie,* vol. I, Cluj-Napoca, 1993, 1996
2. D. Baz , V. Butescu , N. Stremţan - *Matematici superioare*, Bucharest, 1994
3. Gh. Cenuşă (coord.) – *Matematici pentru economişti*, Bucharest, 2002
4. Gh. Cenuşă, A. Filip - *Matematica pentru economişti*, Cision Publishing House, Bucharest, 2005
5. L. Căbulea - *Matematici aplicate în economie*, Dacia Publishing House, Cluj-Napoca, 2002
6. L. Căbulea – *Cercetări Operaţionale*, Dacia Publishing House, Cluj-Napoca, 2002
7. O. Popescu, I. Radomir – *Matematici pentru economişti*, Blue (Albastra) Publishing House, Cluj-Napoca, 2005
8. I. Purcaru – *Matematici generale si elemente de optimizare*, Economic Publishing House, Bucharest, 1998

8.2. Seminar	**Teaching methods**	
Geometrical method Algebraic method	Exercises, problems, debates	*2 hours*
Simpex algorithm Particular cases: the infinite case, the degenerate case, multiple solution case	Exercises, problems, debates	*2 hours*
Duality. Dual simplex Couple of dual problems - symmetrical form	Exercises, problems, debates	*2 hours*
Re-optimization of linear programming problems Changes in vector c, column vector from matrix A, free term vectors	Exercises, problems, debates	*2 hours*
Parametric linear programming Linear dependency of a vector C parameter, of the free term vector	Exercises, problems, debates	*2 hours*
Transport problems Particular cases: degenerate solution, multiple solution case	Exercises, problems, debates	*2 hours*
Transport problem re-optimization Modification of: the coefficient matrix, what is available and/or what is needed	Exercises, problems, debates	*2 hours*
Parametric transport problems. Linear vector dependency: of the coefficient matrix, what is available and/or what is needed	Exercises, problems, debates	*2 hours*
Special transport problems Problems with: imposed solution, restricted routes, grouped offer or demand	Exercises, problems, debates	*2 hours*
Simple interest Unitary rate, fructification, updating factor, medium values	Exercises, problems, debates	*2 hours*
Simple interest Unitary rate, fructification, updating factor, medium values	Exercises, problems, debates	*2 hours*
Compound interest Gobal fructification/updating factor, initial/final sum	Exercises, problems, debates	*2 hours*

Annual deferred payment (annuities) Anticipated or posticipated payment	Exercises, problems, debates	*2 hours*
Credit and loan reimbursement Direct and indirect methods	Exercises, problems, debates	*2 hours*

Bibliography

1. P. Blaga , A. Mureşan - *Matematici aplicate în economie,* vol. I , Cluj-Napoca, 1993, 1996
2. D. Baz , V. Butescu , N. Stremţan - *Matematici superioare* , Bucharest, 1994
3. Gh. Cenuşă (coord.) – *Matematici pentru economişti*, Bucharest, 2002
4. Gh. Cenuşă, A. Filip - *Matematica pentru economişti*, Cision Publishing House, Bucharest, 2005
5. L. Căbulea - *Matematici aplicate în economie*, Dacia Publishing House, Cluj-Napoca, 2002
6. L. Căbulea – *Cercetări Operaţionale*, Dacia Publishing House, Cluj-Napoca, 2002
7. O. Popescu, I. Radomir – *Matematici pentru economişti*, Blue Publishing House (Albastră), Cluj-Napoca, 2005
8. I. Purcaru – *Matematici Generale Şi Elemente De Optimizare*, Economic Publishing House, Bucharest, 1998

9. Corroboration of course contents with the expectations of the epistemic community's significant representatives, professional associations and employers in the field of the academic programme

For students who continue their studies at a master's program in the field of business administration, the discipline can be a starting point for deepening the field and elaborating works with a high scientific level. Through content, the discipline responds to the current practical needs of employers.

10. Assessment

Activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	*Final evaluation*	*Written paper*	50%
	-	-	-
10.5 Seminar/laboratory	*Continuous assessment*	*Assessment test*	50%
	-		-
10.6 Minimum performance standard: - It is necessary to obtain a minimum grade of 5 (five) in order to pass this subject; - In order to pass the subject, it is mandatory to take the evaluation test.			

Fill in date 12.09.2024

Course leader's signature, Lecturer. PhD. Wainberg Dorin

Seminar tutor's signature, Lecturer. PhD. Wainberg Dorin

Approval date in departament 16.09.2024

Department director's signature, PhD Assoc.Prof. Maican Silvia