

Syllabus

1. Programme information

1.1. Institution	THE BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
1.2. Faculty	Business Administration in Foreign Languages
1.3. Departments	Department of Applied Mathematics
1.4. Field of study	Business Administration
1.5. Cycle of studies	Licence
1.6. Education type	Full-time
1.7. Study programme	Business Administration (in German language)
1.8. Language of study	German
1.9. Academic year	2019-2020

2. Information on the discipline

2.1. Name	Applied mathematics in economics								
2.2. Code	19.0155IF1.1-0002								
2.3. Year of study	1	2.4. Semester	1	2.5. Type of assessment	Exam	2.6. Status of the discipline	O	2.7. Number of ECTS credits	5
2.8. Leaders	C(C)	prof.univ.dr. AGAPIE Alexandru- Licinius				alexandru.agapie@csie.ase.ro			
	S(S)	prof.univ.dr. AGAPIE Alexandru- Licinius				alexandru.agapie@csie.ase.ro			

3. Estimated Total Time

3.1. Number of weeks	14.00
3.2. Number of hours per week	4.00 of which
	C(C) 2.00
	S(S) 2.00
3.3. Total hours from curriculum	56.00 of which
	C(C) 28.00
	S(S) 28.00
3.4. Total hours of study per semester (ECTS*25)	125.00
3.5. Total hours of individual study	69.00
<i>Distribution of time for individual study</i>	
Study by the textbook, lecture notes, bibliography and student's own notes	32.00
Additional documentation in the library, on specialized online platforms and in the field	10.00
Preparation of seminars, labs, assignments, portfolios and essays	24.00
Tutorials	1.00
Examinations	2.00
Other activities	0.00

4. Prerequisites

4.1. of curriculum	Background of Algebra and Calculus at highschool level is highly recommended.
4.2. of competences	The use of mathematical notions in solving problems.

5. Conditions

for the C(C)	The lectures are scheduled in classrooms with multiple boards and videoprojector.
for the S(S)	The seminars are scheduled in classrooms with multiple boards and videoprojector.

6. Acquired specific competences

PREFESSIONAL	C1	Data gathering, formatting and analysis regarding the interaction between the external environment and the business/ organization
PREFESSIONAL	C5	Utilization of specific data bases for business administration

7. Objectives of the discipline

7.1. General objective	<ul style="list-style-type: none"> • Provide students with the basic notions and mathematical tools useful for analysing and modeling economic problems specific to business administration.
7.2. Specific objectives	<ul style="list-style-type: none"> • Provide students with the mathematical tools needed for analysing and modeling economic phenomena of deterministic or stochastic nature. • Learning the basic techniques of differential and integral calculus applied in optimization and to probability theory. • Learning concepts of random event and random variable and probabilistic modeling techniques. • Applications to various components of business administration. • Provide a background needed to address topics of Business statistics, Econometrics. • Create a positive attitude towards the idea of interdisciplinarity.

8. Contents

8.1. C(C)		Teaching/Work methods	Recommendations for students
1	Introductory lecture. The objectives of the discipline and the acquired competencies as result of learning; the specification of methodology, requirements and evaluation standards. Reviewing notions, concepts and mathematical methods to be used in this course.	Classical lecture using the blackboard or videoprojector, interaction with students.	Lecture notes and bibliographical materials are made available in electronic format. It is recommended the study of lectures and solving homework for a good interaction during the seminars.
2	Infinite series of numbers. Definitions, examples, applications. Geometric and harmonic series.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
3	Functions of several variables. Limits, continuity, partial derivability, differentiability. Higher order partial derivatives and differentials.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
4	Applications of partial derivatives in economy and their interpretations: production functions, Cobb-Douglas production function, returns to scale, utility functions, partial elasticity.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
5	Extremes of functions of several variables. Constrained optimization. The method of Lagrange multipliers.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem

6	Applications of extremes in economy: profit maximization, partial elasticity and marginal functions, utility maximization, consumer's demand analysis, homogeneous functions.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
7	Integral calculus. Review of integrals on compact sets. Improper integrals: Gamma, Beta and Euler-Poisson integrals. Calculating improper integrals that define continuous random variables moments.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
8	Introduction to probability theory. Events, operations with events, de Morgan's laws. Classical definition of probability, axiomatic definition of probability, properties.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
9	Additive and multiplicative formulas for probabilities. Total probability formula, Bayes' formulas.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
10	Random variables: definition, properties. Discrete and continuous random variables. Examples. Operations with discrete random variables. Distribution function, properties. Elementary functions of random variables.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
11	Discrete bivariate distributions. Joint distribution, marginal and conditional distributions.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
12	Numerical characteristics. Initial and central moments of random variables, covariance, correlation and properties.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
13	Discrete and continuous classical distributions frequently used in practice and connections.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem
14	Laws of large numbers and central limit theorems.	Classical lecture using the blackboard or videoprojector, interaction with students.	Idem

Bibliography

- Bădin, L., Giuclea, M., Agapie, A, Applied Mathematics for Business and Economics, ASE, Bucuresti, 2015
- Bradley, T., Patton, P., Essential Mathematics for Economics and Business, J. Wiley & Sons Ltd, 2002
- Chiang, A.C., Wainwright, K., Fundamental Methods of Mathematical economics
- Rosser, M., Basic Mathematics for Economists, Routledge, 2003
- Simon, C.P., Blume, L., Mathematics for Economists, Norton & Company, Inc. , 1994

8.2. S(S)		Teaching/Work methods	Recommendations for students
1	Initial evaluation of the background level of the students. Recapitulative exercises on concepts from highschool.	Applications at the blackboard, continuous dialogue with students.	Before the seminar the students should study the previous lectures.
2	Infinite series of numbers. Definitions, examples, applications. Geometric and harmonic series.	Applications at the blackboard, continuous dialogue with students.	Idem
3	Interest calculation and present / future values calculation of a series of installment payments.	Applications at the blackboard, continuous dialogue with students.	Idem
4	Calculating partial derivatives. Determination of 1st and 2nd order total differentials. Examples of applications to economics.	Applications at the blackboard, continuous dialogue with students.	Idem
5	Finding extreme points, unconstrained and constrained. The least squares method.	Applications at the blackboard, continuous dialogue with students.	Idem
6	Generalized integrals. Gamma and Beta integrals.	Applications at the blackboard, continuous dialogue with students.	Idem
7	Operations with random events. Probability as a frequency. Probability formulas.	Applications at the blackboard, continuous dialogue with students.	Idem
8	Midterm evaluation test.	Test paper	Idem
9	Classical schemes of probability.	Applications at the blackboard, continuous dialogue with students.	Idem
10	Discrete random variables. Classical distributions useful in economic applications.	Applications at the blackboard, continuous dialogue with students.	Idem
11	Continuous random variables. Classical distributions useful in economic applications.	Applications at the blackboard, continuous dialogue with students.	Idem
12	Practical examples of discrete bivariate distributions.	Applications at the blackboard, continuous dialogue with students.	Idem
13	Applications of the laws of large numbers and the central limit theorems.	Applications at the blackboard, continuous dialogue with students.	Idem
14	Recapitulative problems.	Applications at the blackboard, continuous dialogue with students.	Idem

Bibliography

- Bădin, L., Giuclea, M., Agapie, A, Applied Mathematics for Business and Economics, ASE, Bucuresti, 2015
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9. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, of the professional associations and representative employers in the field associated with the programme

According to the structure and content of the curriculum, the students will acquire the mathematical foundations useful also to other domains and disciplines.

10. Assessment

Type of activity	Assessment criteria	Assessment methods	Percentage in the final grade
10.1. S(S)	Knowledge of concepts and methods; solving proposed problems as required.	Test paper	20.00
10.2. S(S)	Knowledge of concepts and methods; solving proposed problems as required.	Evaluation of homework and classroom activities.	10.00
10.3. Final assessment	Knowledge of concepts and methods; solving proposed problems as required.	Exam paper	70.00
10.4. Modality of grading	Whole notes 1-10		
10.5. Minimum standard of performance	The final mark is computed as a weighted average of the marks on activities. The exam is passed if the final mark is at least 5.		

Date of listing,
05/12/2021

Signature of the discipline leaders,

Date of approval in the
department

Signature of the Department Director,