ISM UNIVERSITY OF MANAGEMENT AND ECONOMICS

APPROVED BY
THE STUDY COMMISSION
Minutes No. 02-12-2025-13
as of 26th August 2025

APPLIED MATHEMATICS FOR SOCIAL SCIENCES

Course code	*FUN114*
Compulsory in the programmes	*International Business and Communication*
Level of studies	*Undergraduate*
Number of credits	*6 ECTS (44 in-class hours + 4 hours of consultations + 4 hours of examination, 110 individual work hours)*
Course coordinator (title and name)	*Dr. Marius Kušlys*
Prerequisites	-
Language of instruction	*English*

THE AIM OF THE COURSE

This course aims to develop skills for mathematical modeling of basic economic and managerial problems.

MAPPING OF COURSE LEVEL LEARNING OUTCOMES (OBJECTIVES) WITH DEGREE LEVEL LEARNING OBJECTIVES (See Annex I), ASSESSMENT AND TEACHING METHODS

Course level learning outcomes (objectives)	Learning objectives for BSc in Business Management	Assessment methods	Teaching methods
CLO1. To operate the main concepts, laws, and techniques of linear algebra, linear programming, differential and integral calculus	BLO1.1	Midterm exam, final exam, practice assignments	Lectures, seminars, exercises, individual work
CLO2. To apply these concepts, laws and techniques in economic, financial, managerial analysis and engineering	BLO1.2, BLO4.3	Midterm exam, final exam	Lectures, seminars, exercises, individual work

ACADEMIC HONESTY AND INTEGRITY

The ISM University of Management and Economics Code of Ethics, including cheating and plagiarism are fully applicable and will be strictly enforced in the course. Academic dishonesty, and cheating can and will lead to a report to the ISM Committee of Ethics. With regard to remote learning, ISM remind students that they are expected to adhere and maintain the same academic honesty and integrity that they would in a classroom setting.

COURSE OUTLINE

Topic	In-class hours	Readings
1. Linear functions and models. Cartesian coordinate system. Equations of a straight line (point-slope, point-point, general). **Applications:** linear depreciation, equilibrium point of supply and demand, break-even point, budget constraint, choice of the means of production.	4	[1] Ch. 1
2. Matrices. Types of matrices. Basic operations. Markov chains. **Applications:** planning of production and sales, cost analysis, prediction of market shares.	4	[1] Ch. 2.4-2.5, 9.1
3. Systems of linear equations. Gauss elimination. Underdetermined and overdetermined systems. **Applications:** rational production plan, expected long run market share, investment portfolio problem.	4	[1] Ch. 2.1-2.3, 9.2
4. Linear programming (1). Systems of linear inequalities. Formulation of linear programming problems. The graphical method. **Applications:** profit maximization and cost minimization, optimal production plan, advertising problem, investment portfolio problem.	4	[1] Ch. 3

5. Linear programming (2). An introduction to the simplex method. Standard maximization problems. The dual problem and standard minimization problems. **Applications:** profit maximization and cost minimization, optimal production plan, advertising problem, logistics planning.	4	[1] Ch. 4
CONSULTATION	2	
MIDTERM EXAM	2	
6. The first order derivative. Introduction to limits. Definition of the derivative. Slope of a function, tangent line, velocity. The main rules of differentiation. The chain rule. Increasing and decreasing functions. Monotony, relative and absolute extrema of a function. **Applications:** marginal analysis, profit maximization and cost minimization.	4	[2] Ch. 9, 10.1, 10.4
7. The higher order derivative. Concavity and inflection points. Second derivative test. **Applications:** law of diminishing returns, optimization.	4	[2] Ch. 9.5, 10.2, 10.5
8. Functions of several variables. Definition. Graphs and level curves. Partial differentiation and continuity. Implicit differentiation. **Applications:** marginal analysis, substitute and complementary commodities, marginal rate of substitution.	4	[2] Ch. 12.1-12.2
9. **Extrema of functions of several variables, the Lagrange problem. Applications:** profit maximization and cost minimization, constrained optimization.	4	[2] Ch. 12.3 [3] Ch. 7.4
10. Indefinite integral. Antiderivative. Integration rules. Integration by substitution. **Applications:** profit, cost, revenue analysis.	4	[2] 11.1-11.2
11. Definite integral. Definition. Properties. Newton – Leibniz formula. Area between two curves. Integration by substitution. **Applications:** producers' and consumers' surplus, Lorentz curve and Gini index, mean value.	4	[2] 11.3-11.7
	Total: 48 hours	
CONSULTATION	2	
FINAL EXAM	2	

FINAL GRADE COMPOSITION

Type of assignment	**%**
Individual Components 100%	
Practice assignments	10
Midterm exam (topics 1 – 5)	40
Final exam (topics 6 – 11)	50
Total:	**100**

DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT

1. **Practice assignments** will contribute 10% to the final evaluation. Students are required to complete the designated practice exercises, submit their solutions on the eLearning system by the specified deadline, and present them during the seminar if invited by the lecturer. The evaluation of practice assignments is based on the number of assignments

completed by student. The maximum score will be awarded when all practice assignments have been completed. A deduction of 1 point will be applied for each incomplete assignment. Furthermore, the grade will be reduced if a student declines to present their solutions or fails to attend the seminar.

2. The **midterm exam** will contribute 40% to the final evaluation and will cover topics 1-5. Only non-text calculators and provided formulas will be permitted during the exam. The duration of the exam is 120 minutes.
3. The **final exam** will contribute 50% to the final evaluation and will cover topics 6-11. Only non-text calculators and provided formulas will be permitted during the exam. The duration of the exam is 120 minutes.

The precision of composite evaluations is left intact (up to 2 decimal places) until the end of the course and only the final evaluation will be subject to rounding.

RETAKE POLICY

In case of a failing final grade, students will have a right to the **retake exam**, which will account for 90% of the final grade and will consist of all topics covered throughout the course. Midterm exam and final exam results will be annulled. Only non-text calculators and provided formulas will be permitted during the exam. The duration of the exam is 120 minutes.

REQUIRED READINGS

1. S.T. Tan. Finite Mathematics for the Managerial, Life, and Social Sciences. 9th ed. Cengage learning, 2009, p.612.
2. S.T. Tan. Applied Mathematics for the Managerial, Life, and Social Sciences. 3rd ed. Cengage learning, 2010, p.914.

ADDITIONAL READINGS

3. Barnett, R. A., Ziegler, M. R., Byleen, K. E. & Stocker, C. J. (2019). Calculus for business, economics, life sciences, and social sciences. Pearson.
4. Barnett, R. A., Ziegler, M. R., Byleen, K. E. & Stocker, C. J. (2019). Finite mathematics for business, economics, life sciences, and social sciences. Pearson.
5. K. Sydsaeter, P. Hammond. Essential Mathematics for Economic Analysis. 2nd ed. Prentice Hall, 2006. P.714.
6. Jacques, I. (2018). Mathematics for economics and business. Harlow: Pearson.
7. Hoffmann, L. D., & Bradley, G. L. (2010). Calculus for business, economics, and the social and life sciences. McGraw-Hill.
8. V. Būda. Matematiniai ekonominės analizės pagrindai. Vilnius, TEV, 2008, p. 359.
9. V. Būda, J. Granskas. Diskretieji matematiniai modeliai. Ekonomika ir vadyba. Vilnius, TEV, 2015, p. 256.
10. Haeussler Jr, E. F., Paul, R. S., & Wood, R. J. (2011). Introductory Mathematical Analysis for Business, Economics, and the. Pearson.

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ANNEX I

DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the Bachelor of Business Management
Programmes:
International Business and Communication,
Business Management and Marketing, Finance,

Learning Goals	Learning Objectives
Students will be critical thinkers	BLO1.1. Students will be able to understand core concepts and methods in the business disciplines
	BLO1.2. Students will be able to conduct a contextual analysis to identify a problem associated with their discipline, to generate managerial options and propose viable solutions
Students will be socially responsible in their related discipline	BLO2.1. Students will be knowledgeable about ethics and social responsibility
Students will be technology agile	BLO3.1. Students will demonstrate proficiency in common business software packages
	BLO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	BLO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	BLO4.2. Students will be able to convey their ideas effectively through an oral presentation
	BLO4.3. Students will be able to convey their ideas effectively in a written paper