FINITE MATHEMATICS

Course code	*FUN103*
Compulsory in the programmes	*Economics and Politics, Finance*
Level of studies	*Undergraduate*
Number of credits	*6 ECTS (48 in-class hours + 6 consultation hours + 4 exam hours, 102 individual work hours)*
Course coordinator (title and name)	*Kristina Aldošina*
Prerequisites	*-*
Language of instruction	*English*

THE AIM OF THE COURSE:

This course aims to develop skills for mathematical modelling of basic social and economic phenomena.

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

Course level learning outcomes (objectives)	Learning objectives for BSc in Business Management	Learning objectives for BSc in Social Science	Assessment methods	Teaching methods
CLO1. Ability to operate the main concepts, laws, and techniques of finite mathematics	BLO1 1, BLO1 2	ELO1 1	Midterm exam, final exam	Lectures, tutorials, exercises, examples, practical sessions in small groups, individual work
CLO2. Ability to apply these concepts, laws and techniques in modelling economic and social phenomena	BLO4 3	ELO4 3	Midterm exam, final exam	Lectures, tutorials, exercises, examples, development and analysis of mathematical models; practical sessions in small groups, 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
I. Linear algebra (1). Determinants, properties and calculation techniques. Cramer's rule.	4	S.T. Tan: 2.1; K. Sydsaeter: 16.1-16.5, 16.8
Linear algebra (2). Matrices, operations. Representation of data using matrices. Method of inverse matrix.	4	S.T. Tan: 2.4 - 2.6 K. Sydsaeter: 15.1-15.5, 16.6,16.7

Linear algebra (3). Gauss elimination method. Optional: Gauss-Jordan elimination method.	4	S.T. Tan: 2.2, 2.3 K. Sydsaeter: 15.6
Linear algebra (4). Applied models: rational production plan; Markov chains and stable market shares; Leontief model of balanced economy, flow management (traffic control).	4	S.T. Tan: 2.2, 2.3, 2.7, 9.1, 9.2 K. Sydsaeter: 16.9
II. Linear programming (1). Formulation and graphical solution of linear programming problem. Sensitivity analysis. Applications: optimal plan for two variables, shadow prices.	4	S.T. Tan: 3.1 - 3.4; lecture notes
Linear programming (2). Simplex method for maximization problems. Dual problem. Applications: optimal plan for many variables.	4	S.T. Tan: 4.1 - 4.3 K. Sydsaeter: 17.1-17.5
MIDTERM EXAM	2	
III. Probability theory (1). Sets and counting. Definition of an event. Combinatory.	Self-studies	Lecture notes, S.T. Tan: 6
Probability theory (2). Probability of a random event. Addition and multiplication of probability. Conditional probability. Independent events. Law of total probability. Bayes' theorem. Bernoulli trials. Applications: surveys, decisions, quality control.	4	S.T. Tan: 7.1 - 7.6
Probability theory (3). Discrete random variables and distributions. Expectation, variance, and standard deviation. Binomial and Poisson distributions. Applications: waiting lines and times, expected profit, quality control.	4	S.T. Tan: 8.1 – 8.4
IV. Introduction to the game theory. Non-zero sum games, equilibriums, optimal strategies. Zero-sum games. Strictly determined games. Optimal strategies. Games with mixed strategies for 2×2 matrix games. Expected value of a game. Applications: business and investment decisions.	4	S.T. Tan: 9.4, 9.5; lecture notes
V. Difference equations. First order equations, stability. Second order equations. Linear equations with constant coefficients, stability. Applications: GDP dynamics, market price dynamics, loans, spread of information, population dynamics.	6	Lecture notes; K. Sydsæter at al. Further mathematics for economic analysis: 390-409 pp.
VI. Graph theory. Main concepts, metric characteristics, types. Path, circuit, tree. Circuits. Euler's path and circuit. Fleury's algorithm. Hamiltonian circuit, three algorithms. Applications: travelling problems. Three classical applied problems: shortest path, minimal tree and maximal flow.	6	Lecture notes.
	Total: 50 hours	
CONSULTATIONS	6	
FINAL EXAM	2	

FINAL GRADE COMPOSITION

Type of assignment	%
Individual Components 100%	
Midterm exam	50
Final exam	50
Total:	**100**

DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT
(Provide short descriptions and grading criteria of each assignment)

The overall assessment of the course (total maximum of 100% is possible) will be composed from evaluations of 2 assignments which are described as follows:

1. **written** closed book **midterm exam** will count for the **50%** of the final evaluation and will consist of several real-life problems. Only non-text, non-graphical calculators (without solving functions), provided sheet with formulas and language dictionary (without explanations and definitions) will be allowed.

2. **written** closed book **final exam** will count for the **50%** of the final evaluation and will consist of several real-life problems. Only non-text, non-graphical calculators (without solving functions), provided sheet with formulas and language dictionary (without explanations and definitions) will be allowed.

RETAKE POLICY
(Provide short description and percentage of the final grade)

In case of the negative final evaluation, retake is possible. It will cover material of the whole course and will comprise **100%** of the final mark. Marks earned during the semester will be annulled. Structure of the retake is the same as of exam.

ADDITIONAL REMARKS

3. Practices will be organized in form of consultations (workshops). Students will have possibility to solve both skill-forming and applied problems (individually or in groups), ask questions, discuss.

4. In case of pure online studies, examination form will be changed to an open book written exam or oral examination (depending on the number of students in the group). These changes will be presented to students directly via email without change of the syllabus.

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

REQUIRED READINGS

S.T. Tan. Finite mathematics for the Managerial, Life, and Social Sciences. 8th ed. Thomson Brooks/Cole, Thomson Learning, 2006. P.646.

ADDITIONAL READINGS

1. K. Sydsæter, P. Hammond. Essential Mathematics for Economic Analysis. 2nd ed. Prentice Hall, 2006, p.714.
2. V. Būda, J. Granskas. Diskretieji matematiniai modeliai. Vilnius, TEV. 2015.

ANNEX

DEGREE LEVEL LEARNING OBJECTIVES

Learning objectives for the <u>Bachelor of Business Management</u>
Programmes:
International Business and Communication,
Business Management and Marketing, Finance,
Industrial Technology Management

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

Learning objectives for the <u>Bachelor of Social Science</u>
Programmes:
Economics and Data Analytics,
Economics and Politics

Learning Goals	Learning Objectives
Students will be critical thinkers	ELO1.1. Students will be able to understand core concepts and methods in the key economics disciplines
	ELO1.2. Students will be able to identify underlying assumptions and logical consistency of causal statements
Students will have skills to employ economic thought for the common good	ELO2.1.Students will have a keen sense of ethical criteria for practical problem-solving
Students will be technology agile	ELO3.1. Students will demonstrate proficiency in common business software packages
	ELO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	ELO4.1.Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	ELO4.2.Students will be able to convey their ideas effectively through an oral presentation
	ELO4.3. Students will be able to convey their ideas effectively in a written paper